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TORREY BOTANICAL CLUB

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Three new Charas from California

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(WITH PLATES 10–15)

CHARA HORNEMANNI **Nordhoffiae**

Euchara : haplostephana bistipulata diplosticha dioica major.

Plant large, branched, growing to greatest perfection in deeper water, 25–30 cm. long : in shallower water becoming stouter but shorter and more condensed. Stem usually elongated, 2–3 mm. in diameter, covered with acutely pointed spines, whose length is 2–3 times the diameter of the stem ; diameter of the spines 160 μ : cortex of the stem "diplosticha," the cortex tubes uneven, the primary series more prominent, but not larger ; the tubes of the secondary series unite obliquely. (In the type species *Chara Hornemanni* Wallm., the cortex tubes are much more regular and uniform in size.) Spines scattered, isolated, cylindrical in form, in length more than double the diameter of the stem, about 160 μ in diameter ; in younger internodes, these spines are much shorter, often even triangular in shape : verticils somewhat remote, the internodes about equal the length of the leaves ; the verticils consist of about 9 leaves : leaves spreading or partly reflexed, 6–8 cm. long, 325 μ in diameter at lowest segment, consisting of 4 or 5 nodes : stipules subtending the verticils, arranged *in a single series of cells, double the number of the leaves ;* stipule cells well developed, attaining a length of 15–20 mm., very similar in form and size to the spines, though a trifle stouter (25 μ in diameter).

The stiffly spreading stipules in the growing plant give a peculiar appearance, which prominently distinguishes the plant from all other adjoining vegetation, by the stiff "beard" about the stem, beneath the verticils of leaves.

[Issued 25 June.]

The leaves are not corticated, but their nodes are provided with whorls of bracts, similar in shape to the spines and stipules. The leaf terminates in a single cell which much exceeds the length of the bracts of the ultimate node. The male and female fruit are born *on separate plants;* the male plants are usually larger, especially more elongated and diffusely branched; the female shorter and usually found in quite shallow water. The foliae, bearing antheridia, have nodes bearing 6 verticillate bracts without an antheridium: but on a node bearing an antheridum will be found 5 nodal cells bearing bracts; while the antheridium clearly occupies a nodal cell, replacing a bract. In the spore-bearing leaves, however, one finds a normal number of bracts and also a sub-sporal bract, developed (often imperfectly) from a cell, which would in a normally developed, monoecious chara bear an antheridium. This pre-bracteole or sub-sporal bract is frequently developed no farther than a swollen cell or a minutely protruding elongation, but all degrees of development may be noticed, as shown in the engraving; even to a pre-bracteole quite as long as the entire sporophydium. The antheridium is 710 to 720 μ in diameter. The oöspore is black, about 700 μ long (650–780) and 400 μ broad *with 7 prominent but not acute ridges.* The coronula of the sporophydium is rounded in outline and consists of 5 connivent cells.

The type of the species, *Chara Hornemanni* Wallm., is also tropical or sub-tropical in habitat; it was first collected near Caraças, South America, and is known from the West Indian islands, Florida (Key West), Texas (collected by Wright), Lower California (San Ramon), collected by Mrs. Brandegee, etc. It is distinguished by its broader and more inflated bracts, stipules and spines; its *cortex-tubes* are much more regular and evenly developed but well rounded out, Diplosticha; the spines of the stem are rather inflated than cylindrical, 4–5 mm. long, 400–500 μ in diameter, abruptly pointed, often paired, one longer by one shorter. The stipules and bracts similar in appearance to the spines. In this species the development of *a pre-bracteole cell* is also noted. The oöspore is reported by Braun as *dark-brown* with 10 striae, coronula blunt with connivent cells. A Mexican form is also noted with 8 leaves, 12 stipules and 4 nodes. Antheridium 1000–1200 μ in diameter; oöspore 800 μ long, 450–480 μ broad.

Miss Nordhoff's *Chara* was collected in the small lake at Lakeside in San Diego Co., Calif., where it grows luxuriantly, quite monopolizing one end of the lake, the other end equally occupied by *Chara hirsuta* Allen. The numerous "sinks" in the surrounding country, kept supplied during the long "dry season" by subterranean waters, are also well stocked with this species. The species has a fresh, light green color and is very noticeable by the peculiar beard of stipules which surrounds the stem at intervals. Fertile spore-bearing plants were found only in very shallow water; the large and diffuse plants growing in deep water were all of the male form. Collected by Miss Nordhoff in August, 1898.

The appearance of this variety differs strikingly from *Chara Hornemanni* A. Br.; the latter is stouter with more nodes on the leaves: the spines of the stem numerous and very broad, diameter 400–500 μ (*Nordhoffiae* 160 μ in diam.); the difference in size of stipules and bracts equally great.

Chara hirsuta

Euchara: corticata diplostephana haplosticha-vera monoica contigua.

Plants slender, elongated, sparingly branched, the branches rivalling the main stem in length and appearance, 5–6 cm. in length (varying with the depth of the water); rarely of greater length, for the plant does not frequent a great depth of water and seems to extend to the surface. A single stem from the root sends out 5 or 6 long shoots, though when growing in shallow water a stem may have quite a "tuft" of shoots near the apex. The stem is extremely hairy; seeming larger than it really is, owing to the long and dense hairs which cover it. The stem is from 450 to 500 μ in diameter; the spines (hairs) arising from it, slender and more than twice as long as the diameter of the stem; 1000–1400 μ long × 75–80 in diameter. The stem is, when mature, singly and quite regularly corticated, though, in the younger portions, the cortex cells do not always quite unite, leaving spaces, which may or may not become occupied by imperfectly developed secondary cortex tubes; this imperfect development of the cortex is frequently noticed in the leaves which are at times quite imperfectly corticated. The spines are quite numerous and very slender, usually developed in pairs from the nodal cortex-cells. These paired cortex-spines are very unequal; often the second cell is developed only as a mere "knob" and not produced as a spine;

but even when deveolped it is very slender and rarely reaches half the length of its better developed fellow. In the upper, younger portion of the stem the cortex tubes are sometimes quite imperfectly developed and very decided spaces may result, which are not filled by a secondary cortex-system; nor does any secondary cortex system attempt to develop; but elongated open spaces are left between the primary cortex-cells which are not contiguous; the spines are also imperfectly developed and simulate the stipular cells. The *stipules* are *double;* the upper cell much longer than the lower, often exceeding the first (lowest) segment of the leaf. The stipules are in appearance quite similar to the spines of the stems and the bracts of the foliae. The leaves (foliae) arise from the nodes of the stem in whorls of about 10, subtended by stipules which are double; one cell extending upward, usually longer than the basal node of the leaf; the lower stipular cell rather less than half the length of the upper; extending downward but not appressed against the stem. A leaf generally bears 5 or 6 nodes, of which 2 or 3 are fertile. The leaves are short and connivent, not at all spreading; they bear fruit abundantly. In some very hairy specimens the whorls of leaves seem scarcely longer than the hairs of the stem. In the older stems the verticils become remote; the internodes often 15–20 mm.; in younger internodes the whorls of short leaves almost touch, and the plant appears moniliform. The bracts at the nodes of the leaf are verticillate, the posterior being very little shorter than the anterior; usually 8 bracts develop at each node; the anterior decidedly longer than the oösporangium. All bracts are linear in shape, resembling the spines of the stem. The leaves are singly corticated and terminate in a "tuft" of nodal bracts generally 4 in number. The plant is monoecious, fruiting very freely. The antheridia mature while the oöspores are still very young, and so far noticed only on quite immature leaves: they are about 30 μ in diameter. The oögonia are very frequently paired on the first and second nodes of the leaf, subtended by linear bracts which are much longer than the entire oögonium and coronula.

The coronula is composed of closely-connivent, square-shaped cells; the whole coronula about 24 μ high by 36 μ broad. The entire oögonium (without the coronula) averaging 2 mm. in height by 0.8 mm. broad; the *oöspore* is black, long and narrow, 650 μ long, 260 μ broad, with 14 or 15 striae, ridges *not prominent.*

The nearest allies, systematically, are doubtless *C. crinita* Wallr., *C. altaica* A. Br. and *C. evoluta* Allen; the former Asiatic, the latter American (northwestern); like these, this plant is singly corticated (stem and leaves), with a tendency to irregularity in the

cortex, though no tendency to the formation of a secondary cortex is seen in this species. This plant bears abundant oöspores like the dioecious species *C. crinita* A. Br.; and the development of spines and bracts is similar to *C. crinita;* also in size it approaches that species though it is much larger than *C. crinita*, which grows in salt or brackish water in the eastern part of the country while *C. hirsuta* A. grows in fresh water in California. There seems no doubt as to its distinctness, though when gathered it seemed possibly a monstrous form of *C. evoluta* Allen, which has been found in several places in northern California and British America, extending eastward into Montana and Dakota; but this species is only an inch or two high and in the northwest Provinces, especially in the Saskatchewan preferring the brackish water pools, which abound there. *C. hirsuta* abounds in one extremity of the pond at Lakeside, San Diego Co., Calif., the other end of which is entirely monopolized by *C. Nordhoffiae* Allen. This species was not noticed in other small pools in the neighborhood nor indeed elsewhere in California. Lakeside is about twenty-five miles inland from the coast; its small lake is a favorite resort in the fall of ducks which seem to be attracted by the immense masses of a profusely fruiting *Potamogeton* (*pectinatus*) which, after a few days, disappears entirely, devoured by the wild ducks, who in turn vanish under the continuous fire of the hunters who flock in swarms after the canvas-backs.

CHARA GYMNOPUS **Sanctae-Margaritae**

The number of sub-species of this widely-different and variable species extending from Africa to the warmer portions of America is already large, but the form now noted cannot be assigned to any hitherto known, and must be described as new.

These plants grow in dense masses or "tufts" 75–100 cm. long, are bright green and moderately incrusted; .75–1 mm. in diameter; *spines* very numerous near the terminal portions of the stem, more scattered or absent entirely on the older stems; rather slender; in length, less than half the diameter of the stem, about 450–700 μ long by 70 μ in diameter.

Verticils of leaves becoming crowded near the apex of the stems, where they overlap, forming dense masses of crowded leaves, consist of 12 leaves: *stipules*, of the upper series, about 700 μ

long, of the lower, 400 μ long about 125 μ broad at the base, tapering to a sharp point; upper series much exceeding the length of lowest leaf-node.

Leaves consist of 8 to 10 nodes, of which the ultimate segment is naked, also *lowest* internode (gymnopus); the 3 or 4 lowest nodes are fertile, *the lowest node always so. The bracts of the leaf-nodes are verticillate*, or the posterior bracts only slightly shorter than the anterior; the latter are often as much as 1200 μ long by 70 μ broad; the posterior bacts 400–500 μ long by 68–70 μ broad; the anterior bracts are generally twice as long as the oösporangium. The lowest node is always fertile; the lowest segment of the leaf is not contracted, about 450 μ in diameter, by about 600 μ in length; the antheridia about 350 μ in diameter, the nucleus oösporangium 680 μ long by 290 μ broad, with 14 ridges.

The nearest allied species is *C. gymnopus* A. Br., var. *elegans* A. Br., from which it is distinguished by the size of the spines (in *elegans*, 100 μ in diameter by 1350 μ long, also thickly covering the upper portion of the stems), the stipules and bracts also are much longer; in *elegans* the stipules 1300 μ long by 50 μ diameter. The relative breadth of the *spines*, *stipules* and *bracts* is greater in var. *sanctae-margaritae* than in *elegans*. At Fig. 5 a comparison is made between the lowest (naked) leaf-node of var. *elegans* and *sanctae-Margaritae*, Fig. 2.

Explanation of Plates

PLATE 10. *Chara hirsuta* Allen. Plant nat. size.

PLATE 11. *Chara hirsuta* Allen. Figs. 1, 2 × 25; 3 × 200; 4, 5 × 50.

PLATE 12. *Chara Hornemanni Nordhoffiae* Allen. Plant ½ nat. size.

PLATE 13. *Chara Hornemanni Nordhoffiae* Allen. Figs. 1, 3, 6 × 25; 2, 4, 5 × 12½.

PLATE 14. *Chara gymnopus Sanctae-Margaritae* Allen. Plant nat. size.

PLATE 15. *Chara gymnopus Sanctae-Margaritae* Allen. Figs. 1, 4 × 50; 2, 3, 4 × 25.

Vegetative Reproduction and Multiplication in Erythronium *

By Frederick H. Blodgett

(With Plates 16–18)

John Burroughs, in Riverby, speaking of the yellow *Erythronium* as he found it in grass-covered meadows, calls attention to the brittle white threads which often appear above the turf. These he found were connected with the immature bulbs, from which they penetrate the soil in various directions.

The nature and purpose of these threads were studied in 1893 and 1894.† They are smooth, scaleless offshoots or subterranean runners, heavily charged with starch. The tip encloses a bud which will become a bulb upon the death of the parent bulb. In this species, and in *E. albidum* the runners arise from the base of the parent bulb, differing in this respect from *E. propullans* Gray, which produces the offshoots from the side of the stem above the bulb.‡

The bulbs formed at the distant end of the runners repeat the process indefinitely, producing annual crops of runners and runner-bulbs until the conditions are met which result in flowering plants. When the necessary vigor, depth and size are reached which cause the development of a flower bud in addition to the leaf bud within the bulb, the annual runners cease to be produced; but when the flowering bulb is removed from those conditions, runners are again produced. The runners are first produced from the bulbs which are formed during the growth of the seedling; the last crop gives rise to flowering bulbs four years or more after the seed has ripened. After the runners cease to be produced, annual bulbs are formed within the mature bulb, resembling the runners in their structure save that there is no lengthening between the terminal bud and the point of origin.

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* Read in abstract before the Society for Plant Morphology and Physiology, New Haven, Dec. 27, 1899.

† Bot. Gaz. **19**: 61. 1894; and **20**: 172. 1895; with illustrations.

‡ Am. Nat., July, 1871. A new Species of *Erythronium*. Dr. Gray mentions also the function of the offshoots in the species *Dens-canis*, *Americanum* and *propullans*.

The mature bulbs are usually in good flower about the middle of April, and the seeds ripen in June. They must be looked for among the leaves upon the surface of the ground, as the entire plant becomes withered and prostrate soon after the fall of the flowers. The ripe seeds are about 6 mm. long, half as wide, and in shape resemble, distantly, a segment of an orange, on account of a prominent raphe and spur along one side (Fig. 1). In texture the seed is firm and hard; in color, brown darkening with age and exposure. The surface is strongly convex, and smooth, though hardly shining. The raphe and spur are absent in seeds which have lain in the soil over winter. In *Erythronium Dens-canis* the raphe is less developed, the spur is present as a slender curved hook or beak from the apex of the seed.*

The seeds remain dormant for nine months—from June to April, when they germinate (Fig. 4), reaching their best development as seedlings (Fig. 7), about the time that the flowers are in their prime. The young plant elongates in opposite directions: the upper end, the tip of the cotyledon, contains a gland (Fig. 6, *g*) by which the food substance of the seed is absorbed. The lower end is protected by a root cap during the first stage of its growth. While the tip of the cotyledon advances the length of the seed, the opposite end penetrates the soil for an inch or more. About the time that the food is absorbed from the seed and the cotyledon frees itself from the empty testa, the descending part changes also. From one side of this portion, close to the tip (*r*, Fig. 5), the radicle is produced, and penetrates farther into the soil. It is plentifully supplied at its base with root hairs (Fig. 9).

The cotyledon is supplied, for the greater portion of its length, with stomata, and functionally it is a cylindrical leaf. Starch is scattered through it, being in all portions of the tissue at *a* (Fig. 23), mostly epidermal in the guard cells of the stomata at *b*, usually near the fibrovascular bundles at *c*, and general again at *d*. Close to the tip (*d*) there is a local deposit of starch, as if provided for the growing cells just within the root cap (*S*, Fig. 5). The part from which the radicle springs enlarges, becomes charged with starch, and forms a bulb (Fig. 9), which is usually forced

*Irmisch: Beiträge zur verg. Morphologie der Pflanzen. Abhand. d. Natur. Gesell. zu Halle, 17^3: 184–195. 1863.

deeper into the soil at the end of a short vertical runner, but may develop without such elongation. Within this bulb the plumule is formed (Figs. 10, 11) and with its formation the first step in the vegetative life of the plant is completed. The second step appears the next spring with the first leaf—the plumule leaf, and ends when the first crop of runner bulbs is formed in May.* From the plumule-bulb only one or two runners are generally produced, but from the larger bulbs three is the more common number (Fig. 12), thus increasing three-fold the number of immature bulbs at each successive crop of runners.

A flowering bulb cannot be produced from seed in less than four years. In the first year the parent bulb would bloom, and ripen its crop of seeds, from six or seven to twenty or more. In the spring of the second year some of these seeds would germinate and form plumule-bulbs. From each of the plumule-bulbs there would appear in the third year a single leaf, and the first runners would be produced at the distant ends of which runner-bulbs would be formed. Some one of these runner-bulbs might be formed under the conditions necessary to produce a flowering bulb, but this is very unlikely; so that one or more years would elapse before a blossom would be formed, thus making a cycle of five or more years. This cycle is shown at Fig. 14, with the forms assumed at each step. At Fig. 26 the multiplication which takes place during the same cycle is shown diagrammatically: one seed; one seedling and plumule-bulb; one runner bulb; three runners with their bulbs; and from each of these three there are produced three more the fifth year, nine in all. Some of the nine will probably produce a flower; those which do not will continue to produce runners in most cases, although a bulb is occasionally found which is apparently recuperating, for the depth is that of the mature bulbs, but only one leaf is produced, and no runners are present.

The following table illustrates the number of plants of different ages during each of five years, supposing that five seeds from each fruit ripen and survive the cycle. Each step is one line lower

* No bulbs of plumule size were found this spring (1900) with runners. The stiff clay soil in which most of them were found may have some influence upon the absence of runners.

than the next preceding one, thus the five "seeds" of 1899, become "5 plumule-bulbs" in 1900, giving a total of 75 plants in 1903.

1899	1900	1901	1902	1903
5 seeds	5 seeds	5 seeds	5 seeds	5 seeds
	5 plumule-bulbs	5 plumule-bulbs	5 plumule-bulbs	5 plumule-bulbs
		5 yearlings	5 yearlings	5 yearlings
			15 2 years old	15 2 years old
				45 flowers
				Total 75 plants

There is very little chance that there will be forty-five blossoms at the end of five years, but as some of the bulbs will probably flower then it is convenient to call the entire number by one name, when they are of the same crop or age.

The seed resembles that of *Iris* in structure.* The walls of the cells are thickened; at certain points the walls of adjacent cells retain their normal thin nature, so that a thin membrane only separates the cell cavities. The cells are arranged with their longer axes nearly perpendicular to the surface of the seed, and in this way form lines which extend to the central portion of the endosperm. Through the center of the seed a mass of dense reserve cellulose extends (Fig. 19) with a few cell cavities scattered through it. In the apex of the seed, and at the beginning of this mass of dense material lies the embryo (Fig. 20). At germination the embryo elongates, pushing the tip of the cotyledon along the center of the seed, absorbing the dense cellulose as it advances. From the cavity thus formed in the center, the solvent action extends toward the surface of the seed, following the lines of the cells, and producing a honey-comb effect (Fig. 8). This honey-combing is the more easily produced on account of the cell arrangement which in a longitudinal section appears as in Fig. 18, *a*; in a horizontal one, as at *b*. The thin wall separating the depressions in the thickened walls of adjacent cells readily dissolves under the action of the absorbing gland of the cotyledon, thus opening a passage for the movement of food materials from cell to cell, as the solvent action extends. The dissolved material moves along the channels so made toward the tip of the cotyledon. The absorbing organ (Fig. 6, *g*) is quite similar in structure, and probably

* Haberlandt, Pflanzen Anatomie, 298.

in action also, to the glands in the hairs of *Drosera*.* One or two layers of cells cover the end of the fibro-vascular bundle which is slightly larger than in the body of the cotyledon. No starch is present in the seed, except in the raphe and spur, where a few grains are scattered through the thin-walled cells (Fig. 18, *c*). During the growth of the seedling starch is found just within the glandular tip of the cotyledon, and in other portions as already stated.

When the food material has been exhausted the cotyledon "elbows" its way to the surface and functions as a leaf. At this stage it resembles an onion seedling, but unlike the onion no further development of foliage occurs until a year later. The plumule-bulb is now forming and is complete, as a bulb, about the time the seedlings wither early in May. The plumule is formed at the base of the swelling at the origin of the radicle (*p*, Fig. 10). At first a mere line of division separates the plumule cells from the other cells of the young bulb. Later the plumule appears as a protuberance at the bottom of a small cavity in the base of the bulb (*p*, Fig. 11). After the cotyledon withers the plumule continues to develop, until a small leaf is formed by the first of November. The plumule-bulb becomes heavily charged with starch early in its development, and thereafter the subterranean portions, except the shoots inside the bulbs are starch bearing.

Runners have their origin at the base of the stem, as a bud in the axil of the inner bulb-scale. From this point (Figs. 13, 15) they push out irregular distances, and at the completion of their growth form bulbs from their terminal buds. Mature bulbs are annually renewed from similar buds (Fig. 17), which develop inside of the parent, beginning as buds in December; the new bulb being full size just after the blossoms fall, in late April. Fig. 30 shows the new bulb at the time that the parent is in prime flower.

The runner and annual bulbs begin to form the buds for the next spring's leaves and flowers, in May. The first evidence is a discolored line or streak extending upward from close to the bottom of the bulb; soon there appears a cavity at the lower end of this streak, in which a short sprout is visible in June or July (Fig. 16). This sprout continues to develop until in November and

* Kerner, Nat. Hist. of Plants, 2: 145. *f.* 126.

December the floral parts are all present and well developed including the ovules and the pollen mother-cells, and the perianth is often tinged with yellow. As the spring advances the bulbs push their sprouts further and further toward the surface, and when the frost is fairly out of the ground the short distance remaining is quickly passed, and the flowers open while there may still be snow on shaded hillsides. The sprout penetrates the soil in the manner of an awl, piercing leaves and decayed wood which may lie in its path,* rather than growing around, or lifting them. For this awl-like work the sprout is protected by a hard tip, which forms the apex of the leaf when the latter expands.

In Fig. 22 the successive steps are shown, by which the flower becomes freed from the enclosing leaves, and assumes its nodding position on the pedicel. At the left (*a*) the sprout has fully penetrated the soil and the leaves have begun to relax their tight clasp upon the bud. The outer and larger leaf expands gradually, while the inner one remains close to the bud as shown at *b*. Next the two leaves bend downward toward their final position, the bud still held by the margins of the inner leaf, *c*. When the leaves have reached nearly their normal position, the bud is released *d*, and it then stands erect between the leaves, as at *e*. In a short time the stem begins to bend near the bud, as at *f*, and as the bud begins to open it has assumed the position shown at *g*.

The last two positions alternate while the plant remains in flower, position *f* being assumed on bright days, when the open flower, with strongly recurved petals, is turned upward, returning to the nodding position at night and on less warm or less sunny days. With the fall of the flower the enlarging fruit assumes an erect position upon the stem, which is retained until the whole plant is withered and lies prostrate on the ground; the ripe seeds remain quite close to the open capsule.

Erythronium Americanum in its mature development normally bears two unequal leaves and a single flower. During the past two or three seasons a number of unusual cases have been observed, in one of which two flowers were borne on an otherwise normal plant. More frequently, one leaf only was present in a plant otherwise normal. Over a dozen plants showing the latter

* Bessey, C. E., A vegetable Awl, Plant World, 1: 132.

form of variation were found in an hours' collection in New Jersey. A plant collected at Washington, D. C., had one leaf (Fig. 28) eight stamens and seven petals; the flower is shown at Fig. 27. Plants having three leaves, with one flower; and four leaves, with two flowers; have been found at long intervals. Fig. 31 shows also three rosettes formed by the root fibers, which indicates the minimum age of the bulb at the depth at which it was found, that is, three years.

Bulbs and runners also have unusual developments, such as surface buds or stimulation growths. The latter seems to have started after a rain or other stimulation, and bursting through the partly formed runner bulb, has grown further into the soil. Fig. 31 shows one in which the nearly formed bulb is burst in two directions, sending a continuation downward, and attempting to produce leaves through the upper opening. These rudimentary leaves showed a trace of yellowish green when first gathered. In bulbs which have been injured, so that the sprout from the center of the bulb fails to develop, a surface bud may be formed. Two such bulbs were recently observed and are illustrated at Fig. 24.

The starch which is very abundant in the bulbs is very finely banded, the fine lines being accompanied at intervals by coarser ones. Fig. 21 shows some of the more common shapes assumed by the starch. Occasional grains are found which are greatly elongated. Often there is a crack or fissure running through the nucleus of the grain but this is not constant, especially in small or medium sized grains.

So far as known, a satisfactory explanation of the common name of *Erythronium* has not been given. Many plants have for their common names the translation of their Latin designation, and the common name will remain through many changes in nomenclature of the scientific descriptions. People seeing in a new country a plant closely resembling one familiar near their homes, usually give the new plant the name of the one already known. Hence when *Erythronium Americanum* was seen, so closely resembling the European species, it received the common name of hat better known plant, dog's-tooth violet.

In the library of the U. S. Department of Agriculture at Washington, there is a copy of Leonard Fuchs' herbal: De his-

toria stirpium insignes * * * Basileae, 1542. When examining this and several other volumes in December, 1897, a description, and excellent illustration were found of the European *Erythronium*, named *Viola Dens-canis*. The *Viola* part of the name is probably due to coincidence in time and place of flowering: *Dens-canis* refers either to the shape of the bulbs, or to the dentations at the base of the petals. In another part of the same volume a number of violets are figured bearing the generic name *Viola* as now.

During the examination of old botanical works in the search for the above reference the following names were found, applied to what has been known since Linnaeus as *Erythronium Dens-canis*.

Pliny: (Historia Mundi; Froben, ed. Basillae 1554), lib. 26, ch. x., p. 472, speaks of "another *Satyrion* (called *Erythriacon*), seeds like *vitex* but larger, smooth; root hard, cortex red, enclosing white within; sweet juice; occurring in mountains."

Dioscorides (Pedacii; Saracenius, ed. 1598), lib. 3, ch. 144, p. 232.

"*Satyrion Erythronium* or *erythraicum* has seeds resembling *linum*, but larger, firm, shining or dull. * * * The cortex of the root rather delicate, and red; the internal portion white, juice sweet, pleasant to the mouth."

Dodoen's Erundeboeck, Antwerp, 1554, gives an illustration of *Satyrion erythronium*, which is probably meant to be one of the *Alliums* as some of the herbalists consider that *Allium ursinum* is referred to by Dioscorides' *Satyrion erythronium*.

Camerarius' Kreuterbuch, Frankfort, A. M., 1586, page 389. In this herbal *Hermodactylus* and *Pseudohermodactylus*, are figured side by side and represent *Iris* and *Erythronium* respectively. The two names are often given by the old botanists as synonyms of *Dens-canis*, or dog's-tooth, as they most frequently called it.

"*Pseudohermodactylus* is a beautiful plant, it brings two, or rarely three leaves much like the lily. It is spotted with many brown spots. Its flower grows upon a yellowish-brown stem, light purple with brown stamens (fasemen) and a white pistil (stiftlin), in the center. The little leaves [petals] unfold when the sun shines warm upon it, but when, however, they have fallen away, a three-angled knob develops full of yellow seeds. The root is longish, thicker below than above, which are often clustered together. * *

While it does not bloom it brings only one flower. It is called Dentali by Apotheckers in Stiermarck."

In Lobelius' Stirpium, Antwerp, 1576, there is a good cut on page 64 of *Erythronium* with the brief description: "*Erythronium* with colored flowers and unequal leaves." *Satyrion Dens caninus*, *Hermodactylus* and *Pseudohermodactylus* are given as synonyms used in different regions. "* * * Flowers either purple-red or white, or purple and white mixed."

Plunkenetius (Phytographia, 1692, **3**: 130).

"*Dens caninus*, flowers yellow, *Virginianus*." *

Salmon's Herbal, 1710.

"Dogs tooth * * * the same as 'satyrion having red cortex on the root,' in Dioscorides, lib. 3, ch. 144." Three color forms are described having white, red and purple flowers respectively.

Roberto Morrison, of London, in his Plantarum Historia Oxonienis, 1715, page 343, says that the name "*Dens canis* is from the shape of the oblong tuberous root imitating the figure of a dog's tooth, the name is good." "It has a capsule of three distinct valves. * * * When the flower is red the leaves are red spotted, when white the spots are milky."

Gronovius (Flora Virginica, 1739, 151, 1st edition).

"*Erythronium*, leaves oval or oblong, glabrous, dark-spotted, flowers yellow." † (Cited in Linnaeus Spec. Pl. 1753, as var. γ, under *E. Dens-canis*).

Gronovius' Flore Virginia, Lugdonum, 1762, 51 (2d edition), contains a description of our native species. "*Erythronium* with ovate oblong leaves, smooth, dark-spotted. *Dens-caninus aquatalis*, flower yellow, pendulous, leaves ovate-oblong, prostrate, two upon a stalk, glabrous, dark-spotted. Blooming toward the end of March."

The reproduction by offshoots or runners, is mentioned in Miller's Gardener's Dictionary, London, 1754, Vol. I., "*Dens-canis* —Dog's tooth. * * * These plants are propagated by seeds, as

* *Virginianus* is italicized, as are authors cited on the same page, but here it may be a typographical error for a reference to Virginia, since the European form has purple or red flowers.

† This is probably the first description of the American species; especially interesting, as it has the modern genus name. See previous note.

also by offsets from the old roots. * * * The offsets, which these plants produce but sparingly, should be taken off at the time that the old roots are transplanted, * * * toward the latter end of May."

Linnaeus cites descriptions from a number of the early botanists, giving them as synonyms of his *E. Dens-canis*, or as varieties of it. Thus Dodonaeus (Stirpium historiae pemptades, 1616, 203) gives "*Dens caninus*" which Linnaeus regards as synonymous with *Erythronium Dens-canis*, as is also "*Dens-canis* with broad and rotund leaves," of Bauhinus (Pinax, Basiliae, 1671). But "*Dens-canis* with narrow and elongated leaves," of the same author is regarded as variety β under *E. Dens-canis*, and Gronovius's description given in a preceding paragraph, is ranked as variety γ in Species Plantarum, 1753.

Among names used or proposed for use as non-Latin designations of *Erythronium*, Trout Lily and Fawn Lily, have been suggested by John Burroughs in Riverby, on account of the spotted leaves, and because of the alert position which the two leaves often assume. Spring Lily has been proposed, on account of its early flowering, and the lily-shaped blossom. But as a colloquial name, "Roosters" is the least suggestive of the plant meant. This name is used in central New York, among the children especially, because of the custom of "fighting roosters" with the nodding flowers or buds, as is done with violets in New Jersey.

Explanation of Plates

PLATE 16

1. Surface of ripe seeds, June and March, × 3.
2. Longitudinal and cross sections of seed (June), × 3.
3. Cross sections of ovary, April and May, × 12 and × 5.
4. Successive steps in germination, × 1½ and × 3.
5. Longitudinal section of tip of seedling. *f*, fibrovascular bundle. *r*, point of origin of radicle. *s*, deposit of starch.
6. Tip of the cotyledon, showing the absorbing gland, × 10.
7. Full grown seedlings and "elbows," × 1.
8. Tip of cotyledon in partly absorbed seed, × 6.
9. Base of cotyledon showing the enlarged portion which becomes a bulb (plumule-bulb), × 5.
10, 11. Sections of young plumule bulb, plumule at *p*, × 5.
12. Runners, and the developing runner bulbs, × 1½.
13–15. Axillary buds, from which runners will develop. Slightly enlarged.
16. The first stages of the flower-and-leaves shoot (July 1).

PLATE 17

17. Bud of annual bulb (May), × 1.

18. Three sections of seed tissue. *a*, longitudinal. *b*, transverse of endosperm. *c*, cells from raphe, containing scattered starch grains.

19. Longitudinal section of seed, × 15.

20. Embryo in endosperm, × 50.

21. Starch grains from bulb, × 225.

22. Successive steps in the liberation and orientation of the flower, × 1.

23. Seedling, showing the starch-bearing regions, × 1.

PLATE 18

24. Surface buds on bulbs after the sprouts have been destroyed, × 1.

25. Life cycle of five years, showing the successive forms assumed.

26. Diagrammatic life cycle, showing multiplication of one seed in five years.

27. Abnormal flower, petals, 7; stamens, 8; leaf, 1 (Fig. 28).

28. Leaf of 27.

29. Abnormal bulb, twinned by surface bud, × 1.

30. Annual bulb turned aside to show the relation of old and new growth.

31. Mature bulb which has been three years in one place, rosettes of root fibers indicate the age, × 1.

32. Stimulation growth of runner, × 1.

Two new Species of Grimmia from Montana

By R. S. Williams

(With Plates 19, 20)

Grimmia (Eugrimmia) Brittoniae

Growing in dense hemispherical tufts up to 3.5 cm. high. Stems slender, usually bearing long branches. Outer perichaetial and upper stem leaves with blade 1 mm. in length, oblong, somewhat lanceolate pointed, concave, flat on the borders with nearly smooth hair point up to 3 times the length of blade: lower leaves a little smaller with hair point scarcely equaling blade, more concave and somewhat recurved: inner perichaetial leaves minute, triangular, with hair point 8 to 10 times the length of the blade: upper cells irregular, roundish or quadratic, about .006 mm. in diameter, gradually becoming elongated below, toward base 3 or 4 times longer than broad near costa and 1 ½ to 2 times longer than broad near margin: cells but slightly sinuous walled when filled with chlorophyl, later on the walls becoming distinctly sinuous both above and below: sections of costa show two large cells on ventral side with usually 5 or 6 surrounding cells, in single row, on dorsal side: leaf lamina is of a single row of cells with sometimes a doubling of one row in one or both margins: apparently dioicous: fruit unknown.

Growing on shaded perpendicular walls, partly calcareous, in rather dry places. Collected for several seasons in Bad Rock Cañon, Flathead River, Mont.

This species is dedicated to Mrs. Elizabeth G. Britton, to whom all students and lovers of our mosses will ever be indebted.

Grimmia (Eugrimmia?) tenuicaulis

In compact tufts up to 6 cm. high. Stems very slender, often thread-like, with few simple, mostly short branches: perichaetial and upper stem leaves rather broadly ovate-lanceolate, concave, revolute on borders, blade 1 ⅓ mm. long, with rough hair point about ⅔ blade in length, the papillae of point spreading, often recurved: moistened leaves erect-spreading: upper cells irregular, somewhat transversely or vertically elongated, mingled with rounded cells .004–.006 mm. in diameter: cells toward base more or less elongated rectangular, those near margin from nearly

quadratic to twice longer than broad, towards costa becoming 2–4 times longer than broad: cells apparently never distinctly sinuous walled: sections of leaf show costa with two large cells on ventral side and two rows of somewhat smaller cells on dorsal side: lamina of leaf is of one thickness of cells, usually with one or two rows doubled near costa, or sometimes somewhat distant from costa, but not doubled in margin: occasionally the leaf is hyaline nearly ¼ down from apex, the hyaline cells always elongated: evidently dioicous: sporophyte not seen.

Specimens of type collected near Neihart, Belt Mts., Mont., Sept. 21, 1891, also obtained at Marsh Lake and Dawson on the Yukon River.

Explanation of Plates

PLATE 19. *Grimmia Brittoniae*

1. Plant about natural size.
2. Upper leaf, × about 35 diam.
3. Lower stem leaf, × 35 diam.
4. Section of leaf, × 175 diam.
5. Part of perichaetium.
6. Median cells, × 350 diam.
7. Basal cells.
8. Apex of leaf from upper side, × 175 diam.
9. Inner perichaetial leaf.

PLATE 20. *Grimmia tenuicaulis*

1. Plants about natural size.
2. Upper stem leaf, × about 35 diam.
3. Lower stem leaf, × about 35 diam.
4. Part of perichaetium.
5. Median cells, × 350 diam.
6. Basal cells, × 350 diam.
7. Apex of leaf from below, × 175 diam.
8. Section of leaf, × 175 diam.
9. Section of leaf lower down, × 175 diam.

Pohlia (Cacodon) porosa sp. nov.

By Harold Lindberg

(With Plate 21)

Dioica : caespitosa : caulis ad 2 cm. usque altus, in sectione transversa rotundus, 0.25 mm. in diam., cellulae corticales parvae, incrassatae, brunneae, cellulae interiores majores, luteae, fasciculus centralis a cellulis minimis hyalinis formatus, inferna rufo-radiculosus, radicellis papillulosis : folia ovato-lanceolata, acuta, rigida, imbricata, viridia, concava, sicca adpressa, non nitida nec limbata, aetate brunnescentia, inferiora parva, 0.6–1 mm. longa, marginibus planis, superiora sensim sensimque parum majora et densiora, marginibus reflexis, crenulatis, nervo crasso, in media parte 0.075–0.1 mm. lato, basi et aetate brunneolo, infra apicem dissoluto, biconvexo, dorso prominente, cellulae parvae, incrassatae, inter se porosae, irregulares, apicales rhomboideae, 0.02–0.03 mm. longae et 0.005–0.009 mm. latae mediae rectangulares vel subserpentinae, ad 0.05 mm. longae, basilares rectangulares vel quadratae, ad 0.01 mm. latae : bracteae perichetii majores, circa 2 mm. longae et circa 0.55 mm. latae, e basi oblonga acutae, marginibus ubique reflexis et crenulatis, nervo in apice dissoluto, crasso, ad basin valde explanato, laminae ad basin a cellulis 2–3 teratosis formatae, cellulis ut in caeteris ; bracteae interiores obtusiusculae, parvae, 0.5–1.4 mm. longae, marginibus planis, crenulatis, cellulae optime inter se porosae, incrassatae : seta 1.5 mm. alta, rubra, 0.23 mm. crassa, ad basin geniculata, laevissima, sicca flexuosa : theca subcylindrica, erecta et regularis, 2.5 mm. alta et 1 mm. crassa, brunnea, sicca et deoperculata sub ore leniter contracta, cellulis exothecia irregulariter quadratis et rectangularibus, parietibus plus minusve flexuosis, non incrassatis, 0.02 mm. latis ; stomatibus superficialibus ; annulus latus, revolubilis : exostomii dentes 0.33 mm. alti, anguste dolabriformes, acutissimi, pallide lutei, in apice marginati, minutissime papillulosi, lamellis circa 25 : endostomium male evolutum, hyalinum, laevissimum, ciliis nullis vel rudimentariis, processubus angustis, perforatis, rarius dentibus aequilongis : spori pellucidi, virides, laevissimi, 0.017 (0.015–0.019) mm.: operculum 0.4 mm. altum, e basi convexa conicum et obtusum.

Planta mascula ignota.

Species pulcherrima *Pohliae* erectae, Lindb. Rev. bryol., 1883, p. f., proxima, sed differt endostomeo melius evoluto, theca majore, nervocrassiore, cellulis minoribus, incrassatis, inter se porosis, etc.

Hab. in America septentrionalis, Washington, Mt. Rainier, 8 Sept. 1898, ab J. A. Allen in terra humida alt. 6,500 p. s. m. lecta et mihi benevole a Mrs. E. G. Britton communicata.

Explicatio Tabulae 21

FIG. 1. Theca et operculum, × 24.
FIG. 2. Stoma, × 365.
FIG. 3. Cellulae exothecii, × 365.
FIG. 4. Pars peristomii extra visa.
FIG. 5. Pars peristomii, × 260, intus visa, × 260.
FIG. 6. Apex dentis exostomii, × 560.
FIG. 7. Pars annuli, × 260.
FIGS. 8 et 9. Bracteae interiores, × 80.
FIG. 10. Cellulae bracteae interiores, × 365.
FIGS. 11 et 12. Bracteae perichaetii, × 35.
FIGS. 13–15. Folia inferiora caulis feminini, × 35.
FIG. 16. Folia superiora caulis sterilis, × 80.
FIG. 17. Folium caulis sterilis, × 80.
FIG. 18. Areolatio apicis ejusdem folii, × 560.
FIG. 19. Areolatio medii ejusdem folii, × 560.
FIG. 20. Areolatio basis ejusdem folii, × 560.
FIG. 21. Sectio transversa laminae ad basin ejusdem folii, × 560.
FIG. 22. Apex bracteae perichaetii (Fig. 12), × 365.
FIG. 23. Areolatio medii ejusdem folii, 560.
FIG. 24. Sectiones transversae bracteae perichaetii, × 110.
FIG. 25. Sectio transversa ad basin bracteae perichaetii (Fig. 12), × 365.
FIGS. 26–29. Sectiones transversae foliorum, × 365.

HELSINGFORS, FINLAND, 19 January, 1900.

Notes on the Flora of Middle Georgia

By Roland M. Harper

(With Plate 22)

During part of three years spent at the University of Georgia, which is located in Athens, I had opportunity to make a somewhat extensive study of the interesting flora of that vicinity; and in the following notes I have brought together briefly some of the results of my observations on this flora. Although there have been other local botanists in Athens for many years, apparently no observations made since Elliott's time on this immediate region have been mentioned in botanical literature. In Elliott's Botany of South Carolina and Georgia (1816–1821) many plants, some of them types, are mentioned as having been collected in or near Athens by a Mr. Green, and I have been enabled to verify a number of Mr. Green's stations which had been overlooked by later authors after a lapse of nearly eighty years.

Athens, the county-seat of Clarke County, is situated in that section of the state known as Middle Georgia, a region well defined geologically from the two newer sections, north and south Georgia. Middle Georgia occupies about one third of the area of the state, and is distinguished by its geological formation being wholly Archaean or metamorphic. My botanical explorations of this region, in the spring and fall of 1895 and 1896, and the spring of 1897, were confined mainly to the western half of Clarke County, and portions of the neighboring counties of Jackson, Oconee, Walton and Morgan. This territory which I explored lies in the lower foothills of the Blue Ridge, being entirely south of latitude 34°N., and east of longitude 83° 31′W., and ranging from 500 to 800 feet above sea-level.

Taking Clarke County as typical of the surrounding region, its characteristic features of soil, topography, etc., may be briefly described. The predominating soil consists largely of red clay, derived from the disintegration of the granitic rocks which underlie the surface everywhere in this region and outcrop in many places,

especially in the valleys. With the clay are mixed sand, organic matter, and numerous other constituents in proportions varying according to the local conditions.

Topographically, the country is quite hilly. The two branches of the Oconee River, known respectively as the Oconee and Middle Oconee, which traverse Clarke County from north to south, are joined by countless smaller creeks and "branches," and all these streams flow in rather deep and narrow valleys between broad rounded ridges.

The average annual temperature of Athens, which corresponds very closely with the average for middle Georgia, is about 63°F., with the following averages for the four seasons: spring, 62°; summer, 80°; autumn, 64°; winter, 46°. The average annual rainfall is about 55 inches, distributed among the seasons as folfows: spring, 14 inches; summer, 13 inches; autumn, 10 inches; winter, 18 inches.

It has been estimated that about one-half the area of Clarke County is covered with forest, of which one-fifth is original and four-fifths second growth. The adjoining counties, which are not so thickly populated, would no doubt show a larger proportion of forest. The original forest is now mostly confined to the steep sides of the valleys, while the second-growth is found on the more level land along the ridge-tops.

The flora of this region is quite similar in general character to that of the whole belt of country lying at the same elevation along the eastern slope of the Appalachian range from New England to Alabama. A comparison of the flora of Middle Georgia with that of southern New England shows that at least half of the species of each region are common to both. There is less similarity between the flora of Middle Georgia and that of South Georgia, which, although much nearer, belongs to an entirely different floral province.

In the cool shady primeval forests on the northern slopes of the ridges in Clarke and adjoining counties are found many species which are supposed to be strictly Alleghanian in distribution, some of which are mentioned below. On the other hand, the number of species which reach their northern limits in this region is very small. Of the species which I have collected in Middle Georgia,

about 95% are known from the region of the northern manuals, and the remaining 5% are mostly either recently described or recently introduced, or species of very restricted range.

A little study of the plants of the region under consideration shows that they may be divided according to habitat into seven or eight well-marked principal groups. These groups overlap each other somewhat, but not as much as might be expected. In the following lists of plants I have prefixed an asterisk to those species which are mentioned in more than one list, to give some idea of the extent of overlapping.

Taking up the various floral areas in the order of their humidity, the swamps, bogs, meadows and marshes may be considered first. In the region about Athens these are of very small extent, owing chiefly to the narrowness and steepness of the valleys, and the number of hydrophytic species is correspondingly small. The following have been observed mostly in the meadows along Tanyard Branch in Athens and in the Sandy Creek marsh just north of the city:

**Selaginella apus* (L.) Spring.
Typha latifolia L.
Sparganium androcladum (Engelm.) Morong.
Potamogeton diversifolius Raf.
Alisma Plantago-aquatica L.
Sagittaria latifolia Willd.
Paspalum laeve Mx.
Homalocenchrus oryzoides (L.) Poll.
Eragrostis hypnoides (Lam.) B. S.P.
Cyperus flavescens L.
strigosus L.
Kyllingia pumila Mx.
Eleocharis obtusa (Willd.) Schult.
tenuis (Willd.) Schult.
acicularis (L.) R. & S.
Scirpus lacustris L.
Carex lurida Wahl.
vulpinoidea Mx.
**Peltandra Virginica* (L.) Kunth.
Juncus effusus L.
dichotomus Ell.
acuminatus Mx.
Polygonum sagittatum L.
Nymphaea advena Soland.
Ranunculus pusillus Poir.
Agrimonia parviflora Soland.
Callitriche palustris L.
Viola cucullata Ait.
Ludwigia alternifolia L.
Isnardia palustris L.
Lysimachia Nummularia L.
Hydrolea quadrivalvis Walt.
Lycopus Virginicus L.
Mimulus ringens L.
Gratiola sphaerocarpa Ell.
**Ilysanthes refracta* (Ell.) Benth.
Veronica serpyllifolia L.
Galium trifidum L.
Vernonia Noveboracensis (L.) Willd.
**Mikania scandens* (L.) Willd.
Eclipta alba (L.) Hassk.
Adopogon Dandelion (L.) Kuntze.

Eleocharis acicularis and *Scirpus lacustris* do not seem to have been reported from Georgia, at least within recent years, and they are probably rather rare in the state. I collected both in a small bog near the Middle Oconee River in Clarke County on May 28, 1897. The latter is mentioned in Dr. Feay's "Catalogue of Phaenogamous Plants growing spontaneously within thirty miles of Savannah, Ga." (Atlanta Med. Jour., **3**: 167–217. 1860), but might have been collected in South Carolina.

Certain species, particularly trees and shrubs, seem to flourish best on river banks, and are rarely or never found in other situations. The following is a partial list of such species:

**Uniola latifolia* Mx.
* *Danthonia sericea* Nutt.
Arundinaria tecta (Walt.) Muhl.
**Uvularia sessilifolia* L.
Allium mutabile Mx.
* *Smilax rotundifolia* L.
Salix nigra Marsh.
Carpinus Caroliniana Walt.
Ostrya Virginiana (Mill.) Willd.
Betula nigra L.
* *Alnus rugosa* (DuRoi) Koch.
Fagus Americana Sweet.
Quercus nigra L. (*Q. aquatica* Walt.).
Ulmus Americana L.
Morus rubra L.
* *Liriodendron Tulipifera* L.
* *Ranunculus recurvatus* Poir.
Thalictrum polygamum Muhl.
Podophyllum peltatum L.
Calycanthus floridus L.
Arabis Canadensis L.
Platanus occidentalis L.
Philadelphus grandiflorus Willd.
Porteranthus trifoliatus (L.) Britton.
Pyrus angustifolia Ait.
Amelanchier Canadensis (L.) Medic.
Asimina triloba (L.) Dunal.
Ptelea trifoliata L.
* *Acer rubrum* L.
Negundo L.
Tilia pubescens Ait.
Cornus Amonum Mill.
* *Azalea nudiflora* L.
Kalmia latifolia L.
Leucothoë Catesbei (Walt.) Gray.
Vaccinium arboreum Marsh.
Symplocos tinctoria (L.) L'Her.
Mohrodendron Carolinum (L.) Britton.
Styrax Americana Lam.
Fraxinus Americana L.
Chionanthus Virginica L.
Ipomoea lacunosa L.
* *Bignonia capreolata* L.
Catalpa bignonioides Walt.
Cephalanthus occidentalis L.
Lonicera sempervirens L.
Actinomeris alternifolia (L.) DC.

I have found the *Arundinaria* in fruit but once, on May 4, 1897, at Tallasee Shoals on the Middle Oconee River.

In the wet woods, which have some species in common with

the river banks on one hand and the rich woods on the other, I have collected the following plants of interest:

Botrychium obliquum Muhl.
Woodwardia areolata (L.) Moore.
Asplenium Filix-foemina (L.) Bernh.
Onoclea sensibilis L.
Osmunda regalis L.
cinnamomea L.
* *Selaginella apus* (L.) Spring.
Carex intumescens Rudge.
crinita Lam.
tenuis Rudge.
leptalea Wahl.
sterilis Willd.
* *Peltandra Virginica* (L.) Kunth.
Arisaema triphyllum (L.) Torr.
Adicea pumila (L.) Raf.
Boehmeria cylindrica (L.) Willd.
Habenaria flava (L.) Gray.
* *Alnus rugosa* (DuRoi) Koch.
* *Liriodendron Tulipifera* L.
* *Xanthorrhiza apiifolia* L'Her.
* *Ranunculus recurvatus* Poir.
Trautvetteria Carolinensis (Walt.) Vail.
Lindera Benzoin (L.) Blume.
Fenthorum sedoides L.
Tiarella cordifolia L.
Parnassia asarifolia Vent.
Decumaria Barbara L.
Itea Virginica L.
* *Acer rubrum* L.
Falcata comosa (L.) Kuntze.
Phyllanthus Carolinensis Walt.
Impatiens biflora Walt.
Viola obliqua Hall.
primulaefolia L.
Oxypolis rigidus (L.) Britton.
* *Azalea nudiflora* L.
Xolisma ligustrina (L.) Britton.
Steironema ciliatum (L.) Baudo.
Gentiana Elliottii Chapm.
Chelone glabra L.
* *Mitchella repens* L.
Sambucus Canadensis L.
Mikania scandens (L.) Willd.
Pluchea petiolata Cass.

Of greatest interest perhaps are those species which inhabit the rich shady primeval forests on the north sides of hills. Among these may be mentioned the following:

Botrychium Virginianum (L.) Sw.
Adiantum pedatum L.
Asplenium platyneuron (L.) Oakes.
Polystichum acrostichoides (Mx.) Schott.
Poa brevifolia Muhl.
Carex laxiflora Lam.
Tradescantia montana Shuttl.
Juncoides campestre (L.) Kuntze.
pilosum (L.) Kuntze.
Chamaelirium luteum (L.) Gray.
Uvularia perfoliata L.
puberula Mx.
Vagnera racemosa (L.) Morong.
Polygonatum biflorum (Walt.) Ell.
Medeola Virginiana L.
Trillium stylosum Nutt.
Smilax ecirrhata (Engelm.) Wats.
Dioscorea villosa L.
Tipularia unifolia (Muhl.) B. S. P.
Corylus rostrata Ait.

Castanea dentata (Marsh.) Borkh.
Quercus rubra L.
Pyrularia pubera Mx.
Silene stellata (L.) Ait. f.
Alsine pubera (Mx.) Britton.
**Liriodendron Tulipifera* L.
Cimicifuga racemosa (L.) Nutt.
**Xanthorrhiza apiifolia* L'Her.
Anemone quinquefolia L.
Hepatica triloba Chaix.
Syndesmon thalictroides (L.) Hoffmg.
Sanguinaria Canadensis L.
Dentaria laciniata Muhl.
Heuchera Americana L.
Hydrangea arborescens L.
**Hamamelis Virginiana* L.
Waldsteinia parviflora Small.
Geranium maculatum L.
Acer leucoderme Small.
Rhamnus Caroliniana Walt.
Viola palmata L.
**obliqua* Hill.
hastata Mx.
tripartita Ell.
Panax quinquefolium L.
Oxydendrum arboreum (L.) DC.
Pedicularis Canadensis L.
Thalesia uniflora (L.) Britton.
**Mitchella repens* L.
Viburnum acerifolium L.
Eupatorium aromaticum L.
Solidago caesia L.
Nabalus altissimus (L.) Hook.

Several of the above species reach the southern limit of their ranges in this region. *Juncoides pilosum, Corylus rostrata, Pyrularia pubera, Silene stellata, Anemone quinquefolia, Hydrangea arborescens, Viola hastata,* and *Solidago caesia* have been collected by Dr. J. K. Small in the vicinity of Stone Mountain, a few miles farther south but at a higher altitude than my stations for the same species. A few others extend down along the foothills to about the same altitude in eastern Alabama. Some of those which seem to have never been collected farther south than I have found them will be mentioned more in detail at the end of this paper.

In the drier and more open woods, including those on the south sides of hills and the second-growth oak woods which are frequent on the broad summits of the ridges, the flora is quite different from that of the rich shady original woods, although it is in some places difficult to draw a sharp line between them, and a few species are common to both. The following are some of the characteristic species of dry woods:

Panicum commutatum Schult.
Stipa avenacea L.
Melica mutica Walt.
Uniola latifolia Mx.
Danthonia sericea Nutt.
Carex Pennsylvanica Lam.
Tradescantia reflexa Raf.
Juncus tenuis Willd.
**Smilax rotundifolia* L.
herbacea L.

Hypoxis erecta L.
Sisyrinchium Carolinianum Bicknell.
Juglans nigra L.
Hicoria alba (L.) Britton (*Carya tomentosa* Nutt.).
glabra (Mill.) Britton (*C. porcina* Nutt.).
Castanea pumila (L.) Mill.
Quercus digitata (Marsh.) Sudw.
coccinea Wang.
Marylandica Muench.
alba L.
minor (Marsh.) Sargent.
Prinus L.
Silene Virginica L.
Asimina parviflora (Mx.) Dunal.
**Anemone Virginiana* L.
Ranunculus fascicularis Muhl.
Crataegus spathulata Mx.
Boyntoni Beadle.
Prunus serotina Ehrh.
umbellata Ell.
Cercis Canadensis L.
Baptisia bracteata Ell.
**Trifolium reflexum* L.
Psoralea pedunculata (Mill.) Vail.
Stylosanthes riparia Kearney.
Lespedeza hirta (L.) Ell.
Vicia Hugeri Small.
Linum Virginianum L.
Jatropha stimulosa Mx.
Rhus glabra L.
Euonymus Americanus L.
Aesculus octandra Marsh.
Ceanothus Americanus L.
Vitis aestivalis Mx.
cordifolia Mx.
rotundifolia Mx.
Parthenocissus quinquefolia (L.) Planch.
Viola pedata L.
villosa Walt.
multicaulis (T. & G.) Britton.
Ligusticum Canadense (L.) Britton.
Sanicula Canadensis L.
Marylandica L.
Zizia cordata (Walt.) DC.
Cornus florida L.
Chimaphila maculata (L.) Pursh.
Vaccinium stamineum L.
corymbosum L.
Gelsemium sempervirens (L.) Ait. f.
Gentiana villosa L.
Amsonia Tabernaemontana Walt.
Asclepias variegata L.
Vincetoxicum hirsutum (Mx.) Britton.
Convolvulus repens L.
Phlox amoena Sims.
Onosmodium Virginianum (L.) A. DC.
Hedeoma pulegioides (L.) Pers.
Calamintha Caroliniana Sweet.
Salvia urticaefolia L.
Blephilia ciliata (L.) Raf.
Scutellaria integrifolia L.
pilosa Mx.
Trichostema dichotomum L.
lineare Nutt.
Dasystoma Virginica (L.) Britton.
Gerardia tenuifolia Vahl.
**Bignonia capreolata* L.
Ruellia ciliosa Pursh.
strepens L.
Houstonia purpurea L.
Viburnum rufotomentosum Small.
Elephantopus Carolinianus Willd.
Solidago brachyphylla Chapm.
petiolaris Ait.
erecta Pursh.
Sericocarpus asteroides (L.) B.S.P.
Aster patens Ait.
Erigeron pulchellus Mx.
annuus (L.) Pers.
Antennaria plantaginea (L.) R. Br.

Chrysogonum Virginianum L.
Heliopsis helianthoides (L.) B.S.P.
Verbesina Virginica L.
occidentalis (L.) Walt.
Coreopsis major Walt.
Mesadenia atriplicifolia (L.) Raf.
Carduus altissimus L.
Hieracium venosum L.

Another interesting area in middle Georgia may be called the dry fields, or the unforested portions of what are known as the gray gravelly and sandy lands (the latter designation including also those dry woods which have a soil of similar character). The soil of these dry fields consists mostly of gneissoid granite in all stages of disintegration, from large fragments to fine sand and clay. The flora of these fields, while somewhat poor in individuals, is quite rich in species, as may be seen from the following list:

Andropogon scoparius Mx.
Commelina Virginica L.
Tradescantia hirsuticaulis Small.
* *Yucca filamentosa* L.
Smilax glauca Walt.
Silene antirrhina L.
* *Anemone Virginiana* L.
Delphinium Carolinianum Walt.
Cebatha Carolina (L.) Britton.
Sassafras officinale Nees & Eberm.
Crataegus uniflora Muench.
Rubus trivialis Mx.
Fragaria Virginiana Duchesne.
Potentilla Canadensis L.
Prunus angustifolia Marsh.
Morongia angustata (T. & G.) Britton.
Crotalaria rotundifolia (Walt.) Poir.
* *Trifolium reflexum* L.
Cracca spicata (Walt.) Kuntze.
Virginiana L.
Clitoria Mariana L.
Rhynchosia tomentosa (L.)H.& A.
Oxalis recurva Ell.
Acalypha Virginica L.
Tragia urticaefolia Mx.
Euphorbia corollata L.
Rhus copallina L.
Hypericum maculatum Walt.
Passiflora incarnata L.
Kneiffia fruticosa (L.) Raimann.
Daucus pusillus Mx.
Diospyros Virginiana L.
Apocynum cannabinum L.
Asclepias tuberosa L.
obtusifolia Mx.
Acerates viridiflora (Raf.) Eaton.
Ipomoea pandurata (L.) Meyer.
Gilia rubra (L.) Heller.
Phacelia hirsuta Nutt.
Verbena Canadensis (L.) Britton.
Salvia lyrata L.
Scutellaria multiglandulosa (Kearney) Small.
Physalis heterophylla nyctaginea Rydb.
Virginiana Mill.
Linaria Canadensis (L.) Dumont.
Pentstemon hirsutus (L.) Willd.
Plantago Virginica L.
Houstonia longifolia Gaertn.
Eupatorium compositifolium Walt.
Kuhnia eupatorioides L.
Aster ericoides L.
Gnaphalium obtusifolium L.

Silphium Asteriscus L.
Coreopsis grandiflora Hogg.
Senecio Smallii Britton.
Adopogon Carolinianum (Walt.) Britton.

Many of the above species are more common southward and westward, and do not range much farther northeast than Athens.

At many points in the gray gravelly and sandy lands the underlying rock is hard enough to resist disintegration and becomes exposed on the surface. On these granite outcrops, and particularly around their edges, where there is apt to be more or less moisture, are found some rather interesting plants, among them being the following:

Cheilanthes lanosa (Mx.) Watt.
Woodsia obtusa (Spreng.) Torr.
Fimbristylis autumnalis (L.) R. & S.
Carex cephalophora Muhl.
Juncus marginatus Rostk.
Nothoscordum bivalve (L.) Britton.
Agave Virginica L.
Talinum teretifolium Pursh.
Cerastium brachypodum (Engelm.) Robinson.
Arenaria brevifolia Nutt.
Arabis Virginica (L.) Trel.
Diamorpha pusilla Nutt.
Saxifraga Virginiensis Mx.
Trifolium Carolinianum Mx.
Oxalis violacea L.
Crotonopsis linearis Mx.
Sarothra gentianoides L.
**Opuntia vulgaris* Mill.
Myosotis verna Nutt.
**Ilysanthes refracta* (Ell.) Benth.
Plantago elongata Pursh.
Valerianella radiata (L.) Dufr.

Still another peculiar flora is found in deposits of dry sand along the rivers at a few points. The species frequenting this sand are quite few, on account of the very small relative extent of these deposits. I have noticed the following psammophilous species along the two rivers in Clarke Co.:

Pteris aquilina L.
**Yucca filamentosa* L.
Lupinus perennis L.
Ascyrum hypericoides L.
**Opuntia vulgaris* Mill.
**Vaccinium arboreum* Marsh.
Brewerıa humistrata (Walt.) Gray.
Monarda punctata L.
Chrysopsis graminifolia (Mx.) Nutt.

I have found all of these, with the exception of *Lupinus*, much more abundant in south Georgia, where the soil is nearly all sand.

Lastly may be considered the plants of fields, roadsides and

pastures, including the native and introduced weeds. The following is a partial list of such species:

Rumex crispus L.
obtusifolius L.
Acetosella L.
Polygonum Convolvulus L.
Amarantus spinosus L.
retroflexus L.
Phytolacca decandra L.
Boerhaavia erecta L.
Mollugo verticillata L.
Portulaca oleracea L.
Agrostemma Githago L.
Alsine media L.
Cerastium viscosum L.
Anychia dichotoma Mx.
Ranunculus parviflorus L.
abortivus L.
Lepidium Virginicum L.
Coronopus didymus (L.) J. E. Smith.
Sisymbrium officinale (L.) Scop.
Cardamine hirsuta L.
Capsella Bursa-pastoris (L.) Medic.
Draba verna L.
Stenophragma Thaliana (L.) Celak.
Rubus nigrobaccus Bailey.
Duchesnea Indica (Andr.) Focke.
Alchemilla arvensis (L.) Scop.
Rosa rubiginosa L.
bracteata Wendl.
Medicago Arabica (L.) All.
Melilotus alba Lam.
Trifolium procumbens L.
Trifolium arvense L.
pratense L.
repens L.
Vicia hirsuta (L.) Koch.
sativa L.
Geranium Carolinianum L.
Oxalis stricta L.
Melia Azederach L.
Acalypha ostryaefolia Riddell.
Euphorbia maculata L.
Preslii Guss.
Modiola Caroliniana (L.) Don.
Oenothera laciniata Hill.
Hartmannia speciosa (Nutt.) Small.
Daucus Carota L.
Chaerophyllum Teinturieri Hook.
Anagallis arvensis L.
Heliotropium Indicum L.
Lithospermum arvense L.
Verbena bracteosa Mx.
Lamium amplexicaule L.
Solanum nigrum L.
Carolinense L.
Datura Tatula L.
Verbascum Thapsus L.
Blattaria L.
Veronica peregrina L.
arvensis L.
Plantago major L.
lanceolata L.
aristata Mx.
heterophylla Nutt.
Houstonia coerulea L.
Legouzia perfoliata (L.) Britton.
Solidago Canadensis L.
Erigeron Canadensis L.
Filago nivea Small.
Ambrosia artemisiaefolia L.
trifida L.
Xanthium strumarium L.
Bidens frondosa L.
bipinnata L.
Helenium tenuifolium Nutt.
Achillea Millefolium L.
Anthemis Cotula L.
Chrysanthemum Leucanthemum L.
Arctium Lappa L.
Carduus lanceolatus L.
Taraxacum officinale Weber.

I have not attempted to make all the above lists complete, and have purposely omitted from them several species which are rare or not characteristic of any of these areas. As my observations in this region have not extended over the summer months, I have doubtless omitted many species which are characteristic of the several areas, especially in the first group, that of hydrophytic plants.

In this connection it might be of interest to note what plants do not occur in middle Georgia. The genera *Lycopodium* and *Polygala*, for instance, which are represented by several species both in south Georgia and in the Northern States, seem to be wanting in middle Georgia. Some species of these two genera inhabit the northern forests, while others are found mostly near the coast, and the northern species do not seem to extend quite so far south, or the coast species so far inland, as middle Georgia. Also the genera *Xyris*, *Eriocaulon*, *Lilium*, *Iris*, *Limodorum*, *Castalia*, *Sarracenia*, *Drosera*, *Triadenum*, *Proserpinaca*, *Myriophyllum*, *Bartonia*, *Limnanthemum* and *Utricularia*, which are represented north and south, seem to be rare or absent in middle Georgia. The same might be said also of many species of several other genera, such as *Rhynchospora*, *Ludwigia* and *Sabbatia*. The Orchidaceae, Hypericaceae and Asclepiadaceae are represented by fewer species in middle Georgia than in other parts of the country.

Below I append an annotated list of some of the more rare or noteworthy species of this region which have come under my observation. As no topographical map of the region of my explorations in middle Georgia has yet been made, the altitudes given below are only approximate, but it is believed that none of them are more than 50 feet in error.

POLYPODIUM VULGARE L. Sp. Pl. 1085. 1753

There is a station for this species on the south side of Bobbin Mill Creek, Clarke Co., where it grows on the brow of a high granite cliff and some adjacent smaller rocks, in company with its congener, *P. polypodioides*. The altitude is about 620 ft. This is probably the southern limit of *P. vulgare* in eastern North America.

POA BREVIFOLIA Muhl. Gram. 138. 1817

In rich woods along Bobbin Mill Creek, flowering in March.

Altitude 610 feet. This species does not seem to have been reported from as far south as Georgia before.

Scirpus Georgianus sp. nov. (Plate 22)

Culm erect, about 5 dm. tall, terete or nearly so, 3–4-leaved. Leaves smooth, the lower ones about 2 dm. longand 1 cm. wide; sheaths green; involucral leaves about 3, the longest exceeding the umbel; umbel thrice compound, many-rayed, the longest rays about 1 dm. long, rather stiff and ascending, the shorter and secondary rays most spreading at right angles; spikelets green, about 3 mm. long, 10–15-flowered, in glomerules of 5–10; scales orbicular-ovate, about 1.5 mm. long, with somewhat loosely-spreading awns; margins thin and membranous, colorless or slightly tinged with brown; midrib green, with a narrow whitish keel, prolonged into an awn about half as long as the body of the scale with 3 or 4 short scarious teeth at its apex, giving the whole spikelet a characteristic striate and bristly appearance: stamens 3: style 3-cleft: achene oblong, about 0.8 mm. long, short-beaked, compressed-triangular: bristles none.

A unique species, allied to *S. atrovirens* and *S. polyphyllus* (neither of which is known in middle Georgia), but differing from both in its greener spikes, peculiar scales, and absence of bristles. Another distinguishing character is found in the sheaths of the leaves. In the two related species an elongated triangular portion of the summit of the sheath opposite the insertion of the leaf is thin and membranous, while in *S. Georgianus* this portion is represented by only a narrow horizontal brownish band, as shown in the accompanying plate.

Scirpus Georgianus is further distinguished from *S. atrovirens* by its more numerous glomerules of fewer spikelets, and from *S. polyphyllus* by its fever and broader leaves.

Collected in muddy alluvial soil on the bank of the Middle Oconee River, Clarke Co., May 23, 1897. Accompanied by *Ranunculus recurvatus* and *Thalictrum polygamum*. One specimen has been placed in the herbarium of the New York Botanical Garden.

Explanation of Plate 22

1. Portion of plant, × ⅔.
2. Single spikelet, × 10.
3. A scale, × 20.
4. Achene and style, × 20.

Of the genus *Tradescantia*, as revised by Dr. J. K. Small,* I have collected the three following species in Clarke Co.:

T. REFLEXA Raf. New Fl. N. A. **2**: 87. 1836

In dry woods, Athens, flowering in May. This seems to be one of its easternmost known stations.

T. HIRSUTICAULIS Small, *l. c.*, 233

Dr. Small cites three stations for this species, and I can now add a fourth and northernmost, viz: Athens, where I collected it in dry fields near the Oconee River in 1895, 1896 and 1897. It flowers there in April. About half of the specimens observed have pink-purple petals, while the rest have bright blue ones like most other species of the genus. There seem to be none with intermediate colors, and the two forms make a pleasing contrast when growing side by side.

T. MONTANA Shuttl.; Britton, Ill. Fl. **1**: 377. 1896

In rich woods, Athens, flowering in May. Altitude about 650 ft. This station is farther south and at a lower altitude than any previously known.

JUNCOIDES PILOSUM (L.) Kuntze, Rev. Gen. Pl. 725. 1891

In rich shady woods, Athens; with *J. campestre*, and flowering at the same time (March and April). Altitude about 650 ft.

UVULARIA SESSILIFOLIA L. Sp. Pl. 305. 1753

Alluvial soil on banks of Middle Oconee River, between Tallasee Shoals and Princeton. Altitudes 600–650 ft. This is near its southern limit.

UVULARIA PUBERULA Mx. Fl. Bor. Am. **1**: 199. 1803

In rich woods in Athens and near Bobbin Mill Creek, altitudes 610–650 ft. This species has not been reported from so far south by recent authors, but Elliott (Bot. S. C. & Ga. **1**: 391) describes a *Uvularia* "from specimens sent * * * from Athens, by Mr. Green," and asks "Do they belong to this species?" His uncertainty is probably due to immature material. The description applies very well to the flowering state of *U. puberula*, and as I have collected this species in fruit also, with leaves fully expanded,

* Bull. Torr. Club, **24**: 228–236, May 29, 1897.

probably in the identical locality from which Mr. Green secured his specimens, there can no longer be any doubt as to the identity of Elliott's plant.

SISYRINCHIUM CAROLINIANUM Bicknell, Bull. Torr. Club, **26**: 221. My. 1899

Common in dry soil, Clarke Co. My specimens, collected near the Middle Oconee River, April, 1897, have been identified by Mr. Bicknell.

CYPRIPEDIUM PARVIFLORUM Sal. Trans. Linn. Soc. **1**: 77. 1791

Collected in dry woods near Middle Oconee River at Tallasee Shoals, May 4–7, 1897. Altitude about 725 feet. This seems to be about 100 miles farther south than any previously known station for this species.

TIPULARIA UNIFLORA (Muhl.) B.S.P. Prel. Cat. N. Y. 51. 1888

I have found the evergreen winter leaves and dead flowering stems of this rare and curious orchid in rich woods at four or five stations in Athens.

CASTANEA DENTATA (Marsh) Borkh. Handb. Forstb. **1**: 741. 1800

In rich woods, Athens, altitude 650 ft. Trees rather few and small, and fruiting sparingly. Is the southern limit of this species moving northward? Bartram (Travels, p. 36) mentions "*Fagus castanea*" as one of the trees observed in the vicinity of Wrightsborough, Ga. (now in McDuffie Co.), in 1773, and Chapman (Fl. S. States, ed. 1, 424. 1860) gives its range as "West Florida and northward" (perhaps an error), but it is now generally supposed to be confined to the mountains and northern states.

PYRULARIA PUBERA Mx. Fl. Bor. Am. **2**: 233. 1803

About 15 or 20 individuals in an area of a few square rods in rich shady woods, Athens. Altitude 650 ft. This is near the southern limit of this species. It flowers in April, but formed no fruit in the two seasons in which I observed it, and seems likely to become extinct in this locality. The flowers although apparently perfect all fall off a few days after expanding.

CHENOPODIUM BOSCIANUM Moq. Enum. Chenop. 21. 1840

In October, 1896, I collected this plant in dry open woods on

the University campus in Athens. It does not seem to have been reported from Georgia before.

BOERHAAVIA ERECTA L. Sp. Pl. 3. 1753

In cultivated ground on the University campus, Athens, in flower October, 1896. This is one of its northernmost stations.

ALSINE PUBERA (Mx.) Britton, Mem. Torr. Club, **4**: 107. 1893

Rich shady woods, Athens. Altitude about 650 ft. Flowering from March to May. Southern limit?

CERASTIUM BRACHYPODUM (Engelm.) Robinson; Britton, Mem. Torr. Club, **5**: 150. 1894

Collected on dry rocks near Oconee River, Athens, March 15, 1897, with *Myosotis verna* and *Valerianella radiata*. New to the southeastern states.

CIMICIFUGA RACEMOSA (L.) Nutt. Gen. **2**: 15. 1818

Found in May, 1897, with flowers unopened, in rich woods on the southwest side of the Middle Oconee River at Tallasee Shoals and Princeton. Southern limit.

ARABIS CANADENSIS L. Sp. Pl. 665. 1753

In dry rocky woods near Oconee River, Athens, and Jack's Creek, Morgan Co. The latter station seems to be the southernmost known.

DIAMORPHA PUSILLA Nutt. Gen. **1**: 293. 1818

On flat exposed granite rock, Athens, with *Arenaria brevifolia*. This little plant seems to have a very brief period of activity. On April 20, 1897, the plants were in full bloom, covering the rock with a mass of red stems and leaves and pinkish flowers; but when the locality was visited on May 15th all the leaves and petals had fallen, and the now fruiting plants were dried up and scarcely visible.

HEUCHERA RUGELII Shuttl.; Kunze, Linnaea, **20**: 43. 1847

A few specimens of this plant grow in crevices on the north face of the granite cliff mentioned above as the habitat of *Polypodium vulgare*. I have found it in flower from September to November in 1896. This seems to be its southermost known station, and the first in Georgia.

PARNASSIA ASARIFOLIA Vent. Jard. Malm. *pl. 39.* 1803

In wet woods, at one locality in Athens. Altitude 625 ft. Previously known only from the higher mountains. In October, 1896, when I collected my specimens, the plant began to flower about the middle of the month, which is about six weeks later than it does in North Carolina, according to specimens from that state.

CRATAEGUS BOYNTONI Beadle, Bot. Gaz. **28**: 409. Jan. 10, 1900

In dry woods, Clarke Co., where it is one of the commonest species of the genus. My specimens, which were collected in Athens, April, 1897, have been determined by Dr. Britton.

WALDSTEINIA PARVIFLORA Small, Bull. Torr. Club, **25**: 137. 1898

In rich woods near Tanyard Branch and Bobbin Mill Creek, Clarke Co. Altitude about 600 ft. Flowering March–May. These stations are farther south and at a lower altitude than any cited by Dr. Small in his description.

ALCHEMILLA ARVENSIS (L.) Scop. Fl. Carn, ed. 2, **1**: 115. 1770

In April, 1897, I found a small patch of this diminutive weed in a pasture in Athens, which makes the first known station for it in Georgia, and the southermost in this country.

ROSA BRACTEATA Wendl. Bot. Beobacht. 50. 1798

Common along fences and roadsides in Athens, flowering from June to October.

MEDICAGO ARABICA (L.) All. Fl. Ped. **1**: 315. 1785

In fields and along roadsides, Clarke Co. This species does not seem to have been reported as naturalized in the southeastern states before.

ROBINIA PSEUDACACIA L. Sp. Pl. 722. 1753

Collected in rich woods near the Middle Oconee River in Jackson Co., May 6, 1897, in flower. Altitude 700 ft. My specimens, which I refer with some hesitation to this species, were slender shrubs about 2 m. tall, with odorless flowers.

STYLOSANTHES RIPARIA Kearney, Bull. Torr. Club, **24**: 565. Dec., 1897

In dry woods, Athens. My specimens were collected on the University campus, at an altitude of about 725 ft., May 27, 1897.

VICIA HUGERI Small, Bull. Torr. Club, **24**: 490. Nov., 1897

In dry, woods, Clarke Co. I first collected the plant in Athens in April, 1895. This is farther east than any station cited by Dr. Small.

OXALIS RECURVA Ell. Bot. S. C. & Ga. **1**: 526. 1821; Small, Bull. Torr. Club, **21**: 471–474. *pl. 422.* 1894

I can add another to the increasing list of stations for this long misunderstood species, viz: Athens, where I collected it in a dry field near the Oconee River, April 24, 1897. My specimens have been identified by Dr. Small.

CROTON CAPITATUS Mx. Fl. Bor. Am. **2**: 214. 1803

Collected in a railroad cut, Athens, Sept. 20 and Oct. 31, 1896. This seems to be one of the easternmost points reached by this woolly western plant in its travels.

ACER LEUCODERME Small, Bull. Torr. Club, **22**: 367. 1895

Common in rich shady woods, on the north side of hills, in Clarke Co., flowering in April. Identified by Dr. Small.

VIOLA CUCULLATA Ait. Hort. Kew. **3**: 288. 1789. Britton & Brown, Ill. Fl. **3**: 520. *f. 2487b.* 1898

The true *V. cucullata* as now understood, is represented from the southern states in the Columbia University Herbarium by a single specimen from Knoxville, Tenn., and I can find no record of its having been collected farther south. I collected it, however, in a small bog in Athens at an altitude of about 625 ft. in 1896 and 1897, and I also observed what appeared to be the same thing in a springy place near Tallasee Shoals on the Middle Oconee River, at an altitude of 650 ft., May 5, 1897. It begins to flower about the first of April.

VIOLA MULTICAULIS (T. & G.) Britton, Mem. Torr. Club, **5**: 227. 1894

In dry woods, on the north side of the valley of Sandy

Creek, Clarke Co. Altitude about 625 ft. This is one of the easternmost stations for this species, and seems to be also the northernmost known, with the exception of the type locality in Kentucky.

VIOLA HASTATA Mx. Fl. Bor. Am. **2**: 149. 1803

Until within a few years Athens was the only known station in Georgia for this rare species. I have found it in one locality in the city, in low rich woods, at an altitude of about 600 feet, which is probably the lowest altitude at which it has been collected. I secured two flowering specimens in March and April, 1897, at which time there were perhaps a dozen individuals in all.

VIOLA TRIPARTITA Ell. Bot. S. C. & Ga. **1**: 302. 1817; Small, Bull. Torr. Club, **24**: 497, Nov., 1897

V. hastata var. *tripartita* Gray, Bot. Gaz. **11**: 291. 1886.

Elliott (*l. c.*) describes this species, as also the preceding, "from specimens collected near Athens, Georgia, by Mr. Green." I have found it quite abundant in rich woods in several parts of the city. This species was long considered a variety or "aberrant form" of *V. hastata*, but it could never have been so considered by any one who was familiar with the two species in the field; and Dr. Small has recently pointed out some of the many differences between them. I had opportunity to compare the two species in the living state in the spring of 1897, and was impressed with their total dissimilarity. There is, however, a form which in the herbarium appears on superficial examination to be somewhat intermediate between the two, but its affinities are clearly with *tripartita*. This form is **Viola tripartita glaberrima** (*V. hastata* var. *glaberrima* Ging.; DC. Prodr. **1**: 300. 1824; Chapm. Fl. S. States, ed. 3, 34. 1897). It differs from typical *tripartita* in having leaves all undivided and glabrous, but is in other respects very similar. It seems to extend farther south than the type, and is the plant which was taken for *V. hastata* in Florida. I have collected it in rich woods near the Middle Oconee river, about two miles southeast of Athens, in 1896 and 1897. Like *V. tripartita*, with which it is perhaps connected by intermediate forms, its leaves are conspicuously plicate, a character which distinguishes it at once from *V. hastata* in the field, but is not evident in herbarium specimens.

ELAEAGNUS HORTENSIS Bieb. Fl. Taur. Cauc. **1**: 112. 1808

Common in dry woods in the southern part of Athens, appearing perfectly at home. Flowering in April. This plant has evidently been long established, and I have been unable to trace its origin. It does not seem to be cultivated in the vicinity at the present time.

HARTMANNIA SPECIOSA (Nutt.) Small, Bull. Torr. Club, **23**: 181. 1896

In May, 1896, I found a colony of this western species flourishing and blossoming by the roadside between Florence and Bostwick, Morgan Co., and in other similar localities a little later. It does not seem to have been reported from middle Georgia before.

PANAX QUINQUEFOLIUM L. Sp. Pl. 1050. 1753

A few plants in rich shady woods near Bobbin Mill Creek, Clarke Co. Altitude 610 feet. This seems to be the southernmost known station for this species in North America.

SCANDIX PECTEN-VENERIS L. Sp. Pl. 256. 1753

One specimen found on the University campus, Athens, with nearly mature fruit, April 25, 1896. The locality was obliterated the following winter, and I did not see the plant again.

DAUCUS PUSILLUS Mx. Fl. Bor. Am. **1**: 164. 1803

In dry fields, Athens, at altitudes from 600–700 feet. This is one of the northernmost stations known for this species.

LEUCOTHOË CATESBAEI (Walt.) Gray, Man. ed. 2, 252. 1856

On shaded banks of both rivers, Clarke Co. Altitudes 580–675 ft. This is probably near the southern limit of this Alleghanian species.

GALAX APHYLLA L. Sp. Pl. 200. 1753

In rocky woods on both banks of the Middle Oconee River, Clarke Co., rare. Altitudes 600–675 ft. In flower May 28, 1897. This is its southern limit, so far as known.

LYSIMACHIA NUMMULARIA L. Sp. Pl. 148. 1753

This species does not seem to have been reported from the Southern States. It is very abundant in open meadows along

Tanyard Branch in Athens, but rarely flowers. I found only two flowering specimens in 1896 and three in 1897. Though it is not a native, I have never seen it in cultivation in Georgia, and cannot satisfactorily account for its occurrence in Athens.

MOHRODENDRON CAROLINUM (L.) Britton, Gard. & For. **6**: 463. 1893

I have noticed one peculiarity of this species which does not seem to have ever been recorded. Its corollas are open wide some weeks before anthesis, while still green and not half grown. I suspect that the same may be true of the other species of the genus and of the related genus *Styrax*, but I have never had opportunity to observe the aestivation of the latter.

CUSCUTA COMPACTA Juss.; Choisy, Mem. Soc. Gen. **9**: 281. *pl. 4. f. 2.* 1841

On shrubs near Oconee River, Athens. This is one of the easternmost stations for this species, and seems to be the first reported in Georgia.

GILIA RUBRA (L.) Heller, Contr. Herb. F. & M. Coll. **1**: 81. 1895

In dry rocky field near Oconee River, Athens, altitude 600 ft. I can find no record of a more northern station for this species.

Scutellaria multiglandulosa (Kearney) Small

S. integrifolia multiglandulosa Kearney, Bull. Torr. Club, **21**: 482. 1894.

This seems to be the same plant which is described by Dr. Chapman in the first edition of his Southern Flora (1860) as *S. integrifolia* L. and in the third edition (1897) referred to *S. brevifolia* Gray, with a mark of doubt. A comparison of one of my specimens with type material of *S. brevifolia* from Texas (Hall's no. 458) shows the two to be clearly distinct, however. Collected in a dry field in Athens, near the river, in 1895, 1896 and 1897. Altitude 600 ft. Previously known only from south Georgia and Florida. This plant, which Dr. Small now separates as a distinct species, bears little resemblance to *S. integrifolia*, of which it was published as a variety. In all the specimens I have collected the

corollas are invariably white, a character which has not been noted before. It flowers in Athens in May and June.

BLEPHILIA CILIATA (L.) Raf.; Benth. Lab. 319. 1833

In dry woods, Athens, flowering in May and June. This is near its southern limit.

THALESIA UNIFLORA (L.) Britton, Mem. Torr. Club, **5**: 298. 1894

In rich woods, Athens; rare. This species does not seem to have been recently reported from the Southern States, and I have seen no southeastern specimens besides my own.

PAULOWNIA TOMENTOSA (Thunb.) Baill. Hist. Pl. **9**: 434. 1888

This tree is becoming naturalized in Georgia. In Athens it has escaped to the woods in several places, and seems very much at home.

GALIUM UNIFLORUM Mx. Fl. Bor. Am. **1**: 179. 1803

Collected in dry woods on west bank of Middle Oconee River, opposite Princeton, May 28, 1897. Altitude 600 ft. This is its northernmost station, as far as I know.

VIBURNUM ACERIFOLIUM L. Sp. Pl. 268. 1753

In rich woods, Clarke and Morgan Cos. This species is not definitely known from farther south.

VIBURNUM RUFOTOMENTOSUM Small, Bull. Torr. Club, **23**: 410. 1896

In dry woods, Clarke Co.; not rare.

LONICERA JAPONICA Thunb. Fl. Jap. 89. 1784

Dr. Small has noted the naturalization of this species in the Southern States. It is quite common about Athens, growing along roadsides or often in moist woods and along streams, and thriving as well as any native plant. It flowers from May to November, and fruits freely.

CAMPANULA DIVARICATA Mx. Fl. Bor. Am. **1**: 109. 1803

On rocks near Bobbin Mill Creek, Clarke Co., flowering in September. Altitude 620 ft. This is another Alleghanian plant which extends well down into the foothills.

EUPATORIUM COMPOSITIFOLIUM Walt. Fl. Car. 199. 1788

E. coronopifolium Willd. Sp. Pl.

In dry fields, Athens, flowering late in October. This is one of its highest and northernmost stations known.

SOLIDAGO BRACHYPHYLLA Chapm.; T. & G. Fl. N. A. **2**: 218. 1841

In dry oak woods, Athens, altitude 675 ft. Probably its northern limit.

PLUCHEA PETIOLATA Cass. Dict. Sci. Nat. **42**: 2. 1826; Kearney, Bull. Torr. Club, **21**: 265. 1894

Mr. Kearney (l. c.) has pointed out the difference between this species and *P. camphorata* of the coast. It does not seem to have been reported from Georgia however. I found it in September, 1896, in wet woods in the southern part of Athens.

FILAGO NIVEA Small, Bull. Torr. Club, **24**: 333. July, 1897

Evax multicaulis DC. Prodr. **5**: 459. 1836.

Dr. Small has noted the occurrence of this western plant in the vicinity of Stone Mountain. In May, 1896, I found it in a field near Bostwick, in Morgan Co., and a year later in Athens, which is about 50 miles farther east than Stone Mountain.

COREOPSIS GRANDIFLORA Hogg; Sweet, Brit. Fl. Gard. **2**: *pl. 175*. 1825–7

In dry fields, Athens. This is its eastern limit, as far as known.

SENECIO SMALLII Britton, Mem. Torr. Club, **4**: 132. 1893

Common in dry fields, Clarke, Oconee and Walton Cos.

ACANTHOSPERMUM AUSTRALE (L.) Kuntze, Rev. Gen. Pl. 303. 1891

According to Dr. Chapman, who examined one of my specimens, this tropical weed was first introduced in wool at the Augusta factories. If so it has not spread northward as much as southward. In the fall of 1896 I collected it along one of the railroads in Athens, which seems to be the northernmost point it has reached.

COLUMBIA UNIVERSITY.

New Plants from Idaho and from other Localities of the Northwest

By L. F. Henderson

Lepidium montanum papilliferum

Nearly the whole plant, especially the stamens, covered with papillae, which seen in optical section are club-shaped, oblanceolate or obovate, and bright white: radical leaves more divided than in the type, ordinarily bipinnate, and on young plants thickly rosulate: stem inclined to branch more from the base: pod more nearly round.

This plant I should call *L. papilliferum*, deeming it a good species, were it not that I find the pod quite variable in typical *L. montanum*, the leaves running in some cases from pinnate to bipinnate, and a very few papillae occasionally present on some parts of the plant, even on Nuttall's type, with occasionally a very few *hairs* in place of papillae on the filaments but never papillae, as far as I have examined the material in the Gray Herbarium. No. 4121. Growing amongst species of *Artemisia* and *Bigelovia* on the plains about Nampa, southern Idaho, July 30, 1897. The same plant was collected by Miss Mulford at the same place, July 1, 1892. As the plants were nearly as much advanced as were mine, the difference in season is to be accounted for by my plants having been collected near an irrigating ditch, where they flowered late into the summer.

Types in the Gray Herbarium; cotypes in the National Herbarium, in the Idaho Herbarium and in my private collection.

Sisymbrium perplexum

Annual, or possibly biennial, 15–35 cm. high, branching from the base or near it with many wiry ascending branches, pubescent more or less strongly with a stellate pubescence: radical leaves 1–3 cm. long including the petiole, spatulate to oblanceolate, repandly dentate to pinnatifid or nearly entire; cauline leaves oblong-oblanceolate, slightly pinnatifid to entire, sessile or petioled: flowers small, white or slightly tinged with purple: pods on pedicels 5–8 mm. long, more or less torulose, curved or straight, 10 mm. long or more: seeds granular, with incumbent cotyledons: stigma nearly entire, projecting slightly over the placentae: sep-

tum with a broad central nerve, conspicuously celled, the cells in and near the nerve longitudinally elongated, those of the wings very irregularly oblique or transverse.

A singular species, simulating *Braya humilis* remarkably, but differing in the slightly more-lobed leaves, petals with slightly broader claws, a less stellate inflorescence, longer pedicels, and the very peculiar septum. Were it not for this latter peculiarity, the plant might well be considered a variety of *Braya humilis*, but the broad nerve and different cell structure of the septum separate it from this genus, if they do not even invalidate the generic standing of *Braya*. No. 3037. On a dry slope under *Pinus ponderosa*, Salmon River Canyon, beyond Florence, Idaho, July 1, 1895. Altitude about 4800 ft.

Type in the National Herbarium; cotypes in the Gray Herbarium, in that of the University of Idaho, and in my private collection.

Arenaria Salmonensis

Caudex ligneous, much branched below the surface of the ground: stems delicate, 6–8 cm. high, glabrous below, glandular above: fascicled leaves few, glabrous, serrate-margined, about 1 cm. long, acerose, acute; cauline similar but slightly shorter, arcuate or erect: cyme loose, 2–4 times divided, the bracts very scarious, ovate, 1-nerved, 1–2 cm. long: pedicels 2–6 mm. long, these as well as the sepals minutely glandular: sepals 2–3 mm. long, ovate, very obtuse when the scarious edge is well developed or acutish when the edge is less developed: petals a half longer than the sepals, narrowly oblanceolate, obtuse or somewhat erose at apex: stamens commonly 10: pod slightly exceeding the sepals, with 2-cleft valves.

Very near to *Arenaria subcongesta*, but differs in smaller stature, smaller flowers, and fewer radical tufts of leaves.

No. 3505. Dry, gravelly plains, near the source of Salmon River, Blaine County, Idaho, July 20, 1895, near 6500 ft. alt.

Lupinus erectus

25–35 cm. high, erect, many-stemmed, herbaceous, closely appressed canescent to silky, few-leaved, branching slightly above with apparently sterile branches, with peduncle about 5 cm. long: radical leaves very numerous, the petioles twice to thrice exceeding the leaflets, these linear-oblong to narrowly oblanceolate, acute to acuminate, 5 to more commonly 8 in number, 1.5–4 cm. long,

appressed silky-canescent on both sides; cauline leaves 2 or 3, with shorter or very short petioles: stipules adnate, subulate: raceme dense, cylindric, 8–9 cm. long by 2 cm. wide: bracts persistent, exserted and recurved before anthesis, in anthesis equaling the calyx, lanceolate to narrowly subulate: flowers 7–8 mm. long, on pedicels less then 2 mm. long, sub-verticillate: calyx silky, with subequal lips and very small bractlets; the lower lip entire, the upper cleft for two-thirds its length: standard obovate to orbicular, silky, reflexed: keel short-pointed, ciliate: ovary 3–4 seeded, silky: pod unknown.

Differs from *L. canescens* Howell, in much smaller stature, fewer flowers, leaflets not densely appressed, and shorter racemes. From *L. lepidus* it differs in not being densely silky, bracts persistent, banner silky, shorter pedicels, entire lower calyx-lip, flowers smaller, and ovules fewer. From *L. confertus* it differs in less branching character, shorter pubescence, shorter peduncle, entire lower calyx-lip, smaller petals, not narrowly ovate but obovate orbicular silky banner.

No. 3088. Rather dry ground, Long Valley, Boise County, Idaho, July 4, 1895, altitude over 4000 ft.

Type in the National Herbarium; co-type in my private collection.

Lupinus retrorsus

Perennial, 6–9 dm. high, erect, simple or branching, softly hispid-villous with spreading or strongly retrorse white hairs, leafy, rather long-peduncled: leaves with retrorsely hispid petioles; leaflets from as long to half as long as the petioles, greenish villous above, whitish villous below, 4–7 cm. long, narrowly oblanceolate, acuminate or merely acute; stipules long setaceous, silky within, hispid without: raceme from 6 cm. in length when in flower to 30 cm. in fruit, densely flowered but verticillate, apparently few pods maturing: bracts quite persistent, long subulate-aristate, hispid, longer than the buds and many of the flowers: pedicels 1–4 mm. long, with the calyx very villous: flowers 8–12 mm. long: calyx broad at base, slightly saccate, shortly bracteolate, with upper lip broad, shorter then the lower, and cleft into two short broad lobes; lower lip broad, subentire, or with 3 short lobes; banner hairy, broadly obovate, rather retuse from the slightly cohering sides: keel ciliate, rather shortly pointed: pod densely villous with white hairs, 2 cm. long, ripening 3–4 of the 5–6 ovules: seeds small, pinkish-brown and mottled with small brown spots.

Apparently nearest to the next, but very distinct from any *Lupinus* with which I am acquainted.

No. 4608. Low, grassy places, along dry or drying rills, hills of Cœur d'Alene Lake, opposite Harrison, Idaho, August 7, 1898. Flowers were mainly gone at this time. Type in the Gray Herbarium; co-types in my private collection and in the herbarium of the University of Idaho.

LUPINUS LIGULATUS **barbatus**

Differs from the type of *L. ligulatus* Greene, in having stipules not adnate, stem hairy, leaflets more than 6–8 (about 9), raceme long-peduncled, flowers scattered, only 8–10 mm. long, and in the ovary not very villous.

This was referred for me to "*Lupinus Burkii?*" but it differs from that species in its very different pubescence, not broad stipules, in long and open raceme, deciduous bracts, ovules 6–7, I should almost hesitate to refer this plant to *Lupinus ligulatus*, were it not that a specimen is in the Gray Herbarium, collected in Klamath County, Oregon, by Applegate, which more nearly approaches the type in its stipules adnate below, free above, and flowers only 8–10 mm. long. No. 1699. Wet, sunny, clay banks, Glendale, southern Oregon, May, 1897 and 1898.

Type in the Gray Herbarium; co-types in my private collection.

Aster Cordalenus

Growing in clumps, nearly erect, 20–30 cm. high, slender, much branched and leaved, especially above, glabrous below, pubescent above, the rather short branches corymbosely aggregated at top of stem: leaves linear to narrowly oblong-oblanceolate, uppermost lanceolate, 5–8 cm. long, 5–10 mm. wide, entire or some with a few rather distant serratures near the middle, those of the inflorescence not much reduced, strongly ciliate, otherwise glabrous, clasping to strongly auriculate at base: heads very foliaceous, campanulate to hemispherical, 5–7 mm. high by 7–10 wide: outer series of involucral bracts entirely foliaceous, loose, widely linear, acute, exceeding the inner or even exceeding the rays; inner bracts narrower, more or less white with herbaceous tips: rays about 20, blue to violet, 8–10 mm. long: disk-flowers purple, with rather short tube and pappus: akenes from nearly glabrous to strongly pubescent.

This plant is certainly closely related to some of the forms of *Aster foliaceus*, but differs from any of the varieties of this species, (or from any of these *species* more probably), in the smaller heads with even proportionately larger involucral bracts, more crowded stems, corymbose inflorescence, and more abundant smaller leaves tending to become condensed at top of stem. From *A. Oreganus*, which it resembles in general habit and size of heads, the very different involucral bracts completely separate it. No. 2992. Moist gravelly bars, Fort Sherman, Lake Cœur d'Alene, Idaho, August 22, 1897. Types placed in the Gray and National Herbaria, as well as in the herbarium of the University of Idaho, and in my private collection.

Aplopappus insecticruris

Upright or nearly so from erect or ascending rootstocks, 30–40 cm. high, leafly, more or less villous with many-celled and jointed white hairs: radical leaves 8–10 cm. long on petioles of nearly equal length, the blades almost glabrous, petiole and ordinarily midrib villous, subcoriaceous, serrate with rather distant triangular-spinulose teeth, oblanceolate, acute to acuminate; cauline decreasing slightly in size towards the heads, lanceolate to oblong, below shortly petioled, above sessile and clasping, pectinately serrate: heads 1.5–2 cm. high by 2–3 cm. wide: bracts of the involucre loose, about equal in length or the outer foliaceously enlarged and exceeding the head, linear-lanceolate, in 2 or 3 series, subcoriaceous, acute to pungently acuminate, outer villous-pubescent below, glabrous above, inner chartaceous at base: rays conspicuous, light yellow, 1.5 cm. long, about 20 in number: disk-corollas exceeded by the tawny rigid strongly-toothed pappus: style-appendages very hairy, longer than the stigmatic portion: akene from narrowly oblong to shortly subturbinate in different heads of the same plant, thickly covered with coarse more or less appressed dull-white or tawny hairs.

Near to *A. hirtus*, but differing in the nearly glabrous and larger leaves, less wooly stem, larger heads with smoother involucral bracts, coarser pappus, and more pubescent style-branches. The akenes, though similar in the main to those of *A. hirtus* in shape and covering, are inclined to be larger. The peculiarly articulated hairs, resembling the legs of many species of insects, though by no means peculiar to this species or even genus, suggested the name.

No. 3013. Dry, stony ground, western end of Big Camas Prairie, Blaine County, Idaho, July 14, 1895. Type in the National Herbarium; co-types in the Gray and Idaho University Herbaria, as well as in my private collection.

Aplopappus laceratus

Less than a span high, whole plant glandular with short stipitate glands, more or less leafy to the top: leaves rather thin and soft, radical spatulate to narrowly oblanceolate, cauline linear-lanceolate to narrowly linear, green, with long-ciliated margins, 1–4 cm. long, obtuse or acute: involucre campanulate to hemispherical, 1 cm. high and wide, its bracts subequal in two or three rows, lanceolate, acute to acuminate, outer ones green or purplish, inner mainly thin-chartaceous, all with hyaline margins which for the lower half at least are ciliate to pectinately-lacerate: corolla ampliate upwards, deeply 5-toothed, with style-appendages subulate and slightly longer than the stigmatic portion: pappus soft, white, not abundant, equaling the corolla: akenes sub-cuneate, striate, densely sericeous.

Close to *A. Lyallii* as well as to *A. pygmaeus*, but differing decidedly from both. From the first it differs in the more lacerate involucral scales, long-ciliate narrower leaves, shorter and broader akenes, and in the compactly caespitose rootstock. From *A. pygmaeus* it differs in being glandular, in having no broad obtuse outer scales, and in the silky, not pubescent, shorter akenes.

No. 3014. In moist ground amongst rocks, Soldier Mountain near Big Camas Prairie, Blaine County, Idaho, at an elevation of over 10,000 ft., July 15, 1895.

ANTENNARIA DIMORPHA **integra**

Plant spreading, with no well-defined caudex: hairs upon the akene almost altogether entire.

I should hesitate to regard this as a mere variety, in spite of its resemblance to the type, were it not that from its usual habit of spreading by slender, much-divided rootstocks it occasionally departs in the formation of quite a decided caudex, which is, however, in all cases more slender than any form of *A. dimorpha* in the Gray Herbarium; secondly, though the hairs in most cases show no division at all, while the ordinary forms of the species show hardly any simple hairs, yet now and then a hair can be found with notched apex, or with even recurved lobes.

No. 3036. Sandy, dry ground, Long Valley, Boise County, Idaho, at an elevation of 4100 ft., July 5, 1895. Type in the National Herbarium; co-types in the herbarium of the Idaho University and in my private collection.

CIRCIUM UNDULATUM **ciliolatum**

Differs from the type in having the bracts noticeably ciliolate.

I should hesitate to call this a variety rather than a species, were it not that I find hardly a single specimen of *C. undulatum* in the Gray Herbarium that has not a few slightly ciliated bracts, and that it has all the other characters of the species. In having ciliolated bracts it approaches *Circium Grahami*, but differs from that species in more cottony leaves and involucre, smaller stature, and in more prickly involucral bracts.

No number appears with the specimens. I collected this in dry fields near Ashland, southern Oregon, July 8, 1886. Type in the Gray Herbarium; co-type in my private collection.

LYGODESMIA SPINOSA **lanata**

Differs from the type only in being lanate all over, stem more striate, and rather longer peduncles. No. 3229. Gravelly banks and bars of Wood River, Hailey, Blaine County, Idaho, July 21, 1895. Type in the National Herbarium; co-types in the Idaho University herbarium and in my private collection.

Microseris nigrescens (§ *Nothocalais*)

Scapes 26 cm. high from a thick caudex, glabrous save for a little pubescence below the head: leaves 3–24 cm. high, linear, widest above the middle, 3–10 mm. wide, pale green, with plane and entire margins, glandular mucronate at apex: involucres 15–20 mm. high, campanulate, the bracts subequal, lanceolate, acuminate, very thin and scarious, mottled with small dark dots: akenes 6–7 mm. long, narrowly fusiform, with rather short neck, the seed reaching almost to the top of the nearly black akene: pappus exceeding the akene, white, from $\frac{1}{8}$–$\frac{1}{3}$ mm. wide, attenuate from near the base: rays purplish on the outside, exceeding the involucre by about 5 mm.

Certainly closely related to *M. troximoides*, but differing from this species in the smaller nearly black akene, in the very fine pappus, not half so wide as in that species, and in the rather wider,

softer leaves with unwrinkled margins. A nearer approach still to *Troximon*.

No. 3033. Wet meadows, Hot Springs, near Warren's Mining Camp, Idaho County, Idaho, July 2, 1895. Type in my private herbarium; co-type in the National Herbarium.

Whatever claim *Stephanomeria myrioclada* may have to specific rank, a thing I very much doubt, it is certain that Dr. Gray confused two plants in his description of this species in the Synoptical Flora. Eaton's type has the pappus just as he described it in the Botany of the King Exploration—"plumose nearly or quite to the base." Dr. Gray, after his description, cites two plants, one the Eaton plant, collected by Watson, the other the Hawthorne, Nevada plant, collected by M. E. Jones. The label attached to the latter bears this inscription: "*S. lygodesmoides* M. E. Jones, n. sp." It is so entirely different from *S. myrioclada* that I do not hesitate to describe it, since Mr. Jones assures me he has never done so.

Stephanomeria lygodesmoides M. A. Jones

Erect from a woody or even "shrubby" base, glabrous, with numerous rather stout ascending branches throughout: lower cauline leaves not seen; upper narrowly linear, less than 2.5 cm. long, ascending or pendent, entire, acute, the smaller bract-like and squarrose: head 4 mm. high, the involucre of 4 principal bracts and the same number of bractlets: flowers 3–5: akenes smooth, angled, with sordid pappus which is very plumose half way down, the remaining part scabrous.

Probably the same thing, or near it, is in the Gray Herbarium from S. B. Parish, no. 3228, but the branches are thicker and more divaricate, the leaves slightly runcinate-pinnate, and the plant even woodier at base. Mr. Jones assures me that his plant was also very woody at base. The akenes of both plants exactly match. These two plants are certainly near Greene's *Ptiloria divaricata*, but he describes his species, which I have not seen, as herbaceous to the base, and with monocephalous branches, while this plant has often two heads to the branch, and the pappus is not "joined into bundles of three at base."

Nemophila inconspicua

Small, depressed, glaucous, with the leaves and calyx much more strigose than the stem; leaves 5-lobed to parted, with

rounded or obtusely triangular lobes, blade round to ovate in outline and more or less decurrent on the petiole: corolla equaling calyx or slightly shorter: appendages of the calyx ovate, a quarter the length of the ovate-lanceolate lobes: corolla white, 2.5 mm. long, the widely oblong lobes equaling the tube: stamens about equaling the tube, with small cordate anthers, the filaments attached from near the base to one third the way up the tube: internal appendages of the corolla small, narrow, attached to their bases, either acuminate or delicately fimbriate at apex in the same flower: style rather conspicuous and cleft to near the middle: seeds 4, the strong caruncle disappearing with age, deeply pitted, and with innumerable small punctures between the pits.

It simulates small forms of *N. parviflora*, and also of *N. breviflora*, but differs from both very materially. From *N. parviflora* it differs in the short corolla, shape and attachment of internal appendages, shape and size of anthers: from *N. breviflora* in the number of seeds, smaller appendages to the calyx, equality of corolla tube and lobes, shape of internal appendages, and noticeably 2-cleft style; from *N. spathulata* Coville in manifest style, presence of internal appendages, and round capsule.

No. 3289. Loose, moist soil, Soldier Mountain, Blaine County, July 16, 1895. Type in the National Herbarium; co-type in my private collection.

Nemophila Kirtleyi

From 5–20 cm. in height, diffuse and weak; stems leafy to the top, purplish, shortly hispid below, longer hispid above, the hairs strongly divergent to retrorse; all the lower leaves opposite, the upper alternate, ovate in outline, irregularly 5-parted with oblong to ovate lobes, these latter rarely 3-lobed or strongly dentate, slightly retrorse; petioles destitute of auricles, but narrowly winged, hispid-ciliate, as are the sepals and to a less degree the petals: appendages of the calyx ovate, less than ⅓ the length of the lobes; these lanceolate, enlarging in fruit, nearly as long as the lobes of the corolla: corolla one-half to three-quarters of an inch wide, with violet border and whitish center, conspicuously green-spotted near the junction with the stamens: internal appendages conspicuous, half fan-shaped, attached along the greater part of one side, cut into many lobes, these delicately fimbriate: stamens slightly over half the length of the corolla, with anthers oblong-sagittate, retuse, 2.5 mm. long: style half as long as the sepals, cleft one third the way down: peduncles slightly longer than the leaves and proceeding from their axils: pod 4-ovuled, 2–4-seeded: seeds oval, large, deeply pitted.

In aspect the plant resembles small forms of *N. phacelioides* Nutt., but easily separable from that species in opposite leaves, smaller stature, vari-colored corolla, and deeply pitted seeds, to say nothing of its far different range. From *N. aurita* it differs in absence of winged petioles and clasping base of leaves, less divisions to the leaves, and color of flowers. From *N. racemosa* it differs in not having a racemose inflorescence and in larger flowers.

No. 3082. Growing in warm, loose soil under *Pinus ponderosa*, Salmon River hill, beyond Florence, Idaho County, July 1, 1895.

I take pleasure in dedicating this species to my young friend and companion of my 1895 trip, Charles Kirtley, of Salmon, Idaho.

Type in the National Herbarium at Washington, co-types in the herbaria of Idaho and Harvard.

Phacelia minutissima

Annual, 2–6 cm. in height, hirsutely pubescent, glandular above, branching from the base, erect: leaves narrowly oblanceolate to spatulate, the base narrowed into a slender petiole, the blade entire or rarely slightly denticulate: flowers not numerous, shortly pedicelled: sepals spathulate-linear, 2–4 mm. long, moderately or far surpassing the small, bluish-white, oblong-campanulate corolla: the appendages of the latter not long, somewhat v-shaped at the base of the filament: anthers not small for size of flower, on filaments rather stout and one half to two thirds the length of the corolla: capsule rather large, ovate, acute: seeds 1–1.5 mm. in length, somewhat angled by pressure, oval-oblong, marked with a delicate net-work of roundish figures.

Very near to *P. saxicola* Gray, but it differs from that species in seeds being 3 or 4 times larger, (those of *P. saxicola* being only 0.35 mm. in diameter), not round but widely oblong and with much smaller reticulations, in shorter corolla, larger anthers on shorter thicker filaments, in appendages not so "linear" but shorter and making a much more noticeable angle at their juncture with the stamen base.

No. 3386. Dry, gravelly or rocky ground, at 8000 feet elevation, Soldier Mountain, Blaine County, July 16, 1895.

Type in the Washington Herbarium, co-types in the Idaho and Gray herbaria.

Chionophila Tweedyi

This plant was published in the Botanical Gazette, **15**: 66 as *Pentstemon Tweedyi* by Canby & Rose. This the writer thinks an error, which is probably due to the lack of mature fruit when the species was named. The serious question is, not whether it is not a *Pentstemon*, but whether it should not be raised to generic rank. For some time the writer was impressed with the necessity of making a new genus to fit this plant, but the more carefully he weighed each point the more convinced he was that the plant could more naturally be placed in *Chionophila*. The reasons will now be given, while at the same time the really generic characters will not be overlooked.

The genus *Chionophila* was based by Bentham on specimens collected by Dr. James on Pike's Peak in Colorado, and the monotypic species was named for the discoverer. Many specimens of this plant are found in the Gray Herbarium, and they all show the characters as described by Bentham. The most important are a close spicate inflorescence which is noticeably secund; a small glabrous plant, rising from a thick rhizoma; radical leaves with very scarious bases; very large and long calyx; corolla with 4 perfect stamens and one sterile one of much less length, and a many-ovuled ovary. Mr. Bentham had not seen the capsule, but Dr. Gray in the Synoptical Flora describes the seeds as "rather large, oblong, with a very loose and arilliform cellular-reticulated outer coat." I have also noted in some of the corollas I have examined in the Gray Herbarium that they are not perfectly straight at base, but a little larger on one side than the other. The proposed *Chionophila Tweedyi* agrees with this plant generically in the following points. It is about the same height, has just such leaves, the radical with wide scarious bases, and I note in both the same scarious *bracts* surrounding the leaves besides the *leaf-bases* of former years; similar opposite and sheathing cauline leaves; very similar fertile and sterile stamens, the former with equally confluent cells; very similar seeds, the description given by Dr. Gray for *C. Jamesii* fitting *C. Tweedyi* exactly; furthermore the two plants both blacken readily in drying. On the other hand the points of dissimilarity are more apparent than real. The flowers of *C. Jamesii* are arranged in a one-sided spike, those of the

other in an open fewer-flowered raceme; the corolla of *C. Jamesii* is nearly if not quite straight, that of the other is quite saccate at base dorsally, thus causing the corolla to be turned aside at quite a strong angle with the axis of inflorescence and nearly erect pedicels; the calyx of *C. Jamesii* is large and "funnelform," that of *C. Tweedyi* is short and more lobed; while the lower lip of *C. Jamesii* is coated with a thick mat of hairs, the lower one of *C. Tweedyi* is merely strongly papillate.

To sum up, then, the two plants resemble one another in the ovary and seeds, in the stamens fertile and sterile, in the upper parts of the corollas, in the leaves and their bases, and in their blackening when dried. They depart from one another in the inflorescence, in the corolla-base, in the hairiness of the lower corolla-lip, and in the shape of calyx. The seeds and corolla base would cut the plant off from *Pentstemon* more than from *Chionophila*. Neither could the plant be placed in *Collinsia*, though having the gibbous base of this genus, as the stamens are not enclosed in the keel-shaped sac of the lower lip, nor are the seeds "peltate and concave centrally," while the sterile filament is not a mere gland. For these many reasons it seems best to the writer to transfer the plant to *Chionophila* rather than to constitute a new genus for it.

No. 3883. It grows in Idaho, wherever I have found it, not in swampy ground, as Mr. Tweedy finds it, but in open, loose soil at the bases of mountains.

Idaho County in flower, July 2, 1895. Flowers nearly white with tinge of purple. Custer County in fruit, August 2, 1895. Altitude about 6000 ft.

Type in the National Herbarium, co-types in the Idaho and Gray herbaria.

Castilleia Covilleana

Stems numerous from a subvertical rootstock, about 15 cm. high, leafy from the base, throughout glandular as well as villous with long crisped hairs, especially above: leaves narrow, entire at base, 3-parted above into linear more or less circinate lobes, 2–3 cm. long: bracts broader, 3-parted and the central lobe 2–3-cleft, some noticeably circinate, about equaling the flowers: calyx equaling or slightly surpassed by the corolla, *much deeper cleft behind than before*, the divisions shortly cleft into lanceolate acute

lobes, glandular and villous: corolla slightly villous, conspicuously glandular above, with tube twice the length of the lower lip; lip somewhat saccate with three deeply infolded narrow plicae slightly longer than the three erect light-colored subconvolute acute or obtuse lobes: style shortly exserted, with conspicuous 2-lobed stigma: anterior stamens equaling the corolla.

This plant approaches *C. breviflora* Gray in the unequally cleft calyx and the triple pliae or folds of the lower lip of the corolla, but it differs from that species in the calyx being cleft more deeply posteriorly than anteriorly, in the narrower less lobed leaves, in the glandular stem and inflorescence, as well as in the longer crisped hairs, and in the lower lip of the corolla being concealed below the anterior cleft of the calyx. From the first and last of these differences, it seems to constitute a new section in *Castilleia*, provided these characters are found to be constant.

Among rocks, between 10,000 and 11,000 ft. elevation, Soldier Mountain, Blaine County, July 15, 1895. No. 3388. Type in the National Herbarium; co-type in the Idaho Herbarium.

I take pleasure in dedicating this unique species to Mr. Coville, botanist of the Agricultural Department at Washington, through whose instrumentality I was enabled to take the trip in 1895, and to whom I am indebted for the loan of additional material for comparison.

SALIX LONGIFOLIA **tenerrima**

Differs from the type in the following characters:

A smooth shrub, 2–4 meters high, with light bark up to the youngest branches: leaves shorter and narrower, 1–2 mm. wide on fructiferous branches, 2–4 mm. wide on the sterile, glabrous or very early glabrate: pedicels slightly longer, capsule glabrous: scales glabrous save for the slightly ciliate edges.

Shaded, rocky banks of mountain rills gone dry in July, Elmore County, where the type was collected, as well as sandy bottoms, Payette River, Canyon County, Idaho, July 12, 1895, and August 1, 1897.

This beautiful bush has often been referred to *Salix exigua* of Nuttall, but it cannot be that, as Nuttall describes his plant "foliis sericeis—capsulis sessilibus." Neither can it be his *S. fluviatilis*, as he describes that species with leaves twice as wide, stipules none, scales of the female catkin bearded below. Furthermore,

he describes *S. fluvistilis* as abundant at the confluence of the "Oregon and Wallamet." I have never seen this variety west of the Cascade Mts.

Type in the National Herbarium; co-types in the Herbarium of the University of Idaho and in the Gray Herbarium.

Allium simillimum

Stems 2.5–3 cm. high from the bulb, slender, flattened and very narrowly winged; bulb ovate, 8–12 mm. long, loosely covered with many membranous layers, the reticulation of which runs from long rectangular above, through square, to figures below wider than long and from pentagonal to heptagonal: leaves 2, about 1 mm. wide, 8–9 cm. long, falcate to recurved; bracts 2, broadly ovate, acute or acutish: flowers 6–9, 5–6 mm. long, on slender pedicels 2–3 mm. long; segments narrowly oblong, obtuse, delicately denticulate with spreading papillae half the way up, pinkish white, with strong greenish midvein; stamens half to two thirds the length of the segments, the filaments broadened at base and attached for ⅓ their length to the segments: anthers oblong-oval, cordate at base: ovary slightly crested.

Though occupying a place midway between *A. tribracteatum* and *A. parvum*, it differs from both these species in many ways. From the first it differs in narrower leaves, spathe valves 2, and these barely acute not acuminate, shorter and obtuser perianth segments considerably surpassing the stamens and beautifully papillate along the margins. From *A. parvum* it differs in reticulated bulb-coats, slender pedicels, shorter papillate perianth segments, smaller bulbs, and narrower leaves.

No. 3100. Open moist loose soil amongst rocks, at 8000 feet altitude, Sesesh Peak, Idaho County near Boise County, July 2, 1895.

Type in the National Herbarium at Washington; duplicate types in the herbaria of Idaho University and Harvard.

The type of *Calochortus nitidus* was collected by Douglas, "On the Chain of the Blue Mountains, and mountainous districts of the Columbia, from the confluence of the Spokan upwards." This is just the locality in which *Calochortus pavonaceus* Fernald was collected, and it is hardly to be doubted that the two species are identical. The figure in Dougl. Hort. Trans. **7**: p. 277 would seem to prove this. From Douglas' description we would also

learn indirectly that the color of the flower is lilac, and from both description and figure that the plant is of a large stature. Points that Douglas did not bring out and which Mr. Fernald did, are the conspicuous spot on the inner segments, like the spot in a peacock's tail-feather, arching round the gland above, the suborbicular gland slightly wider than high, and, a thing no one seems to have noted, a decided scale below the gland, more or less covered and so disguised by the thick, yellow hairs of the gland.

Now the plant so common about the National Park, and radiating in all directions for many miles from this center, has so many points that differ from the type, that I propose it as a new variety, and as this was undoubtedly Watson's *C. eurycarpus*, a plant he afterwards reduced to *C. nitidus*, this may now stand as

CALOCHORTUS NITIDUS **eurycarpus**

Differs from the type of *C. nitidus* Douglas (*C. pavenaceus* Fernald), in smaller stature, flowers straw-colored to lilac-purple, in having a large round dark spot above the gland, not lunate as in type, in gland from oval to round, thus higher than wide, not wider than high as in *C. nitidus*, and in a narrower, almost invisible lacerately fringed scale.

Common from southern Idaho to the National Park, and collected in various localities during the summers of '95 and '99. Types in the National Herbarium at Washington, as well as in the herbaria of Idaho University and Harvard, nos. 3097, 3098 and 3099.

Anyone who should first examine a plant of the common *Smilacina racemosa* of the Eastern States, and then one of the *S. amplexicaulis* type from California, would unhesitatingly pronounce them separate species. The long narrow petiolate leaves and short style of the former are strikingly different from the ovate crowded sessile leaves and long style of the latter. And yet to one who has observed and studied these plants for years throughout Oregon, Washington and Idaho, these apparently well marked differences disappear, and intergrading forms of every description can be found. Around Portland, Oregon, can be found forms that differ not at all from the Eastern plant in leaves, flowers and fruit. In the same locality can be found other forms that differ

only in slightly longer style. As you go south these forms gradually disappear and give place to the typical California plant about Ashland, Southern Oregon. Even with these marked intergrades, we might take still the California plant as a good species at one end of the string and *S. racemosa* of Portland as the other, were it not that in moving eastward, other perplexing forms arise. In the mountains about Moscow, Idaho, forms can be found on the south and exposed sides of the mountain with more or less of the *amplexicaulis* type, save the leaves are shortly petioled, and the style not so long as in the type. On the north and heavily wooded sides can be found plants of the *racemosa* type, but leaves not so long petioled, and style longer. (In the Gray Herbarium are many eastern forms of *S. racemosa*, that differ quite considerably in the length of petioles.) To make matters worse, in the Yakima country and in eastern Oregon are found types much like the Californian, but with styles as short or even shorter than the eastern *S. racemosa*. I therefore propose the following revision of this group:

1. SMILACINA RACEMOSA Desf., the eastern United States representative, extending west to the Pacific Ocean.

2. SMILACINA RACEMOSA AMPLEXICAULIS Watson, the common plant of California and southern Oregon with crowded ovate amplexicaul leaves and very long styles.

3. SMILACINA RACEMOSA **brachystyla.** Differing from the Californian plant only in the remarkably short style. The type of this variety I have transferred from my own herbarium to that of Harvard, where it will be more accessible. No. 4843.

After much study in the field and the examination of the immense number of specimens in the Gray Herbarium, I see no way to separate *S. sessilifolia* from *S. stellata* save in the length of the pedicels, a very trifling distinction. Forms can be found in the West that match the eastern forms in rootstock, size of fruit, more or less folded leaves which vary from acute to acuminate, and size of flowers. What therefore is left of specific value? I have even found some forms along the Snake River in Idaho that have pedicels no longer than in some extreme eastern forms, and would be considered typical *S. stellata* were the leaves not flat—a character I find by no means uniform in the eastern plants. The western plant is certainly not deserving of more than varietal rank, if even

that, but on account of *generally* longer pedicels and longer and more acuminate leaves, I propose it as

SMILACINA STELLATA **sessilifolia**

Differs from the type in rather longer pedicels and in most cases in longer and more acuminate leaves.

ISOETES BOLANDERI **Sonnei**

Differs from the types as described by Engelmann in shorter, more rigid leaves, apparent absence of stomata, almost orbicular macro-sporangium spotted with small dark spots, and in the wide velum which covers from ⅓ to ⅔ of the sporangium.

Sent to me in 1887 by Mr. C. F. Sonne, who collected it in Donner Lake, California, in October of that year.

Were it not that the velum has been found by me to be a very variable and untrustworthy character in this genus, varying as it does in this plant from ⅓ to ⅔ the width of the sporangium, and in *I. nuda*, *I. Howellii*, and *I. Underwoodi* to such an extent as to make me credit the statement of Mr. A. A. Eaton, that they are all one species, I should be inclined to think this a species distinct from *I. Bolanderi*.

Type in my private collection; co-types distributed to unknown parties.

Isoetes occidentalis

Trunk bilobed: plant always submerged, without stomata: leaves few in small plants, 40–60 in large forms, spreading, rigid, tapering, quadrangular, acute or acuminate, not contracted above the sporangium, dark green, lacking bast-bundles, 10–20 cm. long in the same plant, or merely 5–6 cm. in the smaller: ligule narrowly triangular: velum covering about ⅓ the sporangium: macrospores 400–450 μ, finely crested with simple or confluent crests, or even mere prominences: microspores 30 μ long and very papillose to echinulate.

In a foot or two of water, but never emerging. Lake Cœur d'Alene, Idaho, August–Sept., 1897. No. 4786. Type in my private collection and in the herbaria of Columbia, Harvard and Idaho Universities.

This plant, or something extremely like it, exists in nearly all the lakes in the Northwest. It has been referred to *I. lacustris*,

as well as to *I. echinospora Braunii.* To the latter it bears very little resemblance, since the leaves are rigid, not giving way in the slightest when taken from the water, and the macrospores have never the spinules of that species.

To *Isoetes lacustris* it is certainly very near, perhaps too near for specific delimitation, but it differs from either the European or American forms of that species in the more numerous and tapering leaves, apparently thicker than any forms of *I. lacustris*, in the macrospores smaller and less conspicuously crested, but especially in the smaller and very rough microspores. Perhaps including Engelmann's var. *paupercula* as a small form. In other forms of apparently the same species the leaves are thicker, not so tapering, and merely acute. Such a form I collected many years ago in Lost Lake, near Mt. Hood.

Index to recent Literature relating to American Botany

This Index is intended to include (1) Titles of all papers and books relating to American plants; (2) All papers on botanical subjects by American botanists; (3) Papers of special interest relating to physiological or morphological subjects wherever published. Botanists can aid greatly in this matter by the contribution of separates of their papers especially those published outside the usual botanical journals, such as the publications of learned societies, experiment station bulletins and reports, and journals only occasionally containing botanical matter.

The titles are reprinted monthly on standard library cards of two widths, and are sold to subscribers at the price of one cent per card.

The editors will welcome any notice of omitted titles or other suggestions relative to the greater efficiency of the Index. Address all matter relating to the Index to The Torrey Botanical Club, Columbia University, New York City.

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